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Prepared for

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ENVIRONMENTAL PROTECTION AGENCY
1981 – 1990 ADP REQUIREMENTS STUDY

Consolidated Telecommunications Study

Volume II

Detailed Report

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Prepared For:

Environmental Protection Agency
Management Information and Data Systems Division
Washington, D. C. 20460

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16. Abstracts The purpose and objectives of the Environmental Protection Agency (EPA) Automated Data Processing (ADP) planning activities are to obtain the most cost-effective computing/telecommunications resources to meet EPA's computing requirements for the 1981 through 1990 time period. A detailed system study was performed, which identifies the current and projected ADP requirements for the period 1981 through 1990. Each ADP activity is identified ~~utilizing~~ Zero Based Budget (ZBB) decision units and then projected utilizing a multiple scenario approach. The final documents of this report are:

* Volume 2 is the detailed report

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SECTION 1

INTRODUCTION

1.1 PROJECT PURPOSE AND OBJECTIVES

The purpose and objectives of the EPA ADP Planning Activity are to obtain the most cost effective computing/telecommunications resources to meet EPA's computing requirements for the 1981-1990 time period. EPA has developed a comprehensive plan which follows the Office of Management and Budget (OMB) Circular A-109 (Major System Acquisition) process. The EPA plan addresses:

- Detailed ADP activity study with total management participation to establish short and long term needs
- Detailed study of the current and projected telecommunication needs of the agency
- Study of the impact of conversion to different hardware in terms of cost and time
- Development of an ADP acquisition strategy to obtain the necessary computing/telecommunication resources
- Generation of a Request for Proposal (RFP) to develop alternative system design concepts to meet EPA's needs
- Demonstration of these design concepts to reduce risk and to determine total cost
- Procurement of the required resources and services which provide the greatest benefit to the government

In conjunction with this overall plan, EPA contracted with Informatics to assist them in performing the detailed ADP requirements analysis for the years 1977 through 1990. This contract has to date resulted in the following documentation:

- Detailed methodology and plan for conducting the ADP requirements sutdy and for making long-term projections of needs. Titled Phase I Final Report, dated April 8, 1977

- Consolidated Systems Study, dated December 14, 1977, which presents the detailed current EPA computing workload and projects that workload for the years 1979, 1981, 1985 and 1990

- Consolidated Telecommunications Study, dated December 14, 1977, which presents the detailed current telecommunications workload by location and projection of future workload by location for 1979, 1981, 1985 and 1990

- Conversion Study, dated December 14, 1977, which presents the impact and planning requirements for the agency in converting existing ADP activities at Washington Computer Center (WCC)-COMNET and National Computer Center (NCC) facilities to upgraded equipment

This document is the Final version of the Consolidated Telecommunications Study and presents a mission and telecommunications workload analysis from the current (1977) period through 1990. In addition, this document provides an analysis of alternative future trends in the use of telecommunications for the agency and a description and rationale for the existence of an EPA telecommunications network. This document, in conjunction with the Consolidated System Study and the Conversion Study, represents the EPA statement of needs for the current and future time periods.

The contents of this document address the following:

- Current telecommunications workload and an analysis of agency missions and programs with the supporting roles performed by ADP activities and telecommunications services

- Projected telecommunications workload for the period 1979 through 1990 with an analysis of changing agency missions and programs supported by ADP activities and telecommunication services
- Summary of mission changes and trends in ADP and telecommunications usage over future periods through 1990
- The impact of technological trends and ADP usage patterns upon future telecommunications needs for the agency

This report represents the results of an intensive data gathering effort at all levels of EPA, including headquarters, regional offices, and laboratories. It provides an analysis of this data and a projected statement of telecommunications requirements and needs through the 1990 planning time period for each of several alternative future scenarios.

1.2 REPORT ORGANIZATION AND CONTENT

This report is Volume II of a three part set covering the Consolidated Telecommunications Study. Volume I is the Executive Management Summary and Volume III is the Appendix with supportive detail methodology and tables. This report is organized as follows:

- Section 1: introductory summary of project purpose and objectives; report content and organization
- Section 2: summary of the methodology utilized in data gathering, organizing, and projecting future telecommunications workload
- Section 3: mission and workload analysis for current year (1977) values for each major geographic region, including the ten regional jurisdictions, Washington, D.C. area, and Research Triangle Park, N.C. area
- Section 4: projected telecommunications workload and program changes for the future period through

1990 with values for each of the ten regions, Washington, D. C. area, and Research Triangle Park, N. C. area

- Section 5: major conclusions of the telecommunications study including a summary of mission and program changes, trends in ADP and telecommunications usage.and trends in telecommunications technology relative to future agency needs

SECTION 2

STUDY METHODOLOGY

2.1 INTRODUCTION

The methodology used for the development of the consolidated telecommunications study consisted of:

- Study of existing telecommunications studies
- Series of interviews with EPA management, systems managers and computer service supplier personnel
- Analysis and recording of data collected
- Verification of recorded data
- Quantification of management interviews
- Projections of long term requirements
- Distribution of telecommunications workload by geographic location

2.2 BASELINE WORKLOAD

During Phase I, Informatics identified approximately 190 computer systems and/or ADP activity from the FY77 Zero Base Budget (ZBB) submission. The activities selected represented approximately 80 % of the total timesharing funds projected for use in 1978 by the ZBB. Represented were about 100 major activities at headquarters and the field and approximately 90 regional ADP activities. The Informatics team met with system managers and ADP coordinators to collect all available information, using the ADP activity survey form presented in the Phase I final report. Data collected from the computer service centers were then added to the individual surveys, using the account codes identified as the method of determining telecommunications workload. This additional workload data augmented the data collected in the surveys for major systems and resulted in the capture of all telecommunications workload for the agency in utilizing Washington Computer Center (WCC) and National Computer Center (NCC) facilities.

2.3 PROJECTED FUTURE WORKLOAD

The management level interviews with assistant administrators, deputy assistant administrators, office directors, regional administrators and laboratory directors, were documented and returned to the interviewer for verification. The final version of the interview forms, shown in the Phase I final report as management survey and director survey, was converted to quantitative values. Utilizing a combination of questions asked, values were developed for each of three scenarios, which are:

- Scenario I - comparable to today's activity at EPA and in the country, with a continuation of current economic levels, energy programs, and support for environmental programs
- Scenario II - increased awareness of environmental problems caused by some environmental disasters. Pressure on the Federal government to do more in the environmental area and increased EPA budgets
- Scenario III - serious economic problems and/or shortage of some critical resources which would effect our life style, such as energy, food and water, on a national basis. Pressure to produce the needed resources with secondary concern for the environment

The management responses were consolidated to obtain quantification of the information in the areas of:

- Future growth of EPA as a total entity based on economic growth and future national priorities. These judgments were stated in terms of potential budget changes

- Changes in organizational program and mission responsibility based on changing priorities of the organization. These judgments were stated in terms of increased or decreased activity in the program and missions
- Changes in the use of ADP and associated telecommunications to support the organizational programs and missions. These judgments were stated in terms of the relationship of ADP expenditures to the total program budget
- Changes in the types of applications to be performed by the organization. Considered increases or decreases in data collection, data management, data analysis and modeling, reporting and tracking and program support

The quantification of these judgments are presented on the "Projections of EPA Future" form by organizational entity and included in Volume III, Appendix to Consolidated Systems Study. Not all managers scheduled for interview were available and not all ORD laboratories were visited. Where interviews were not conducted no input was available for quantification, thus, in calculating future requirements the new impact (weighted summary) of the next larger organizational entity was used for long term projections.

A formula was developed to apply the management judgments to the existing ADP activity. To the best of our knowledge, no prediction formula was published which was applicable to this project. This formula was derived by Informatics expressly for EPA to predict its ADP workload. Individual factors for organization usage of ADP, program/mission changes, and overall EPA growth were applied to the 1977 baseline workload to estimate the workload for 1981, 1985 and 1990. Projections of workload changes for 1979 were provided by the ADP activity managers. When estimates were not made by the ADP activity managers, the formula was also used to project 1979 workload. For developmental activities, a 1979 baseline was established by using workload figures from an existing activity with similar characteristics. Estimates for 1981 through 1990 were then calculated manually using the projection formula. In some specific cases, special judgment was used to determine future ADP and telecommunications activity. This included the projections for toxic substances and solid waste. These two programs are to generate extremely high growth in the near and long term future and have very little in terms of a current baseline workload upon which a formula can be applied because of the relative newness of supporting legislation and supporting programs.

Long-term projections were made to each existing ADP activity considering its projected life and the application it was performing. One of the major assumptions made as a result of discussions with all levels of management was that many existing ADP activities will likely end during the 13 year time period but they will be replaced by similar types of applications. These new activities should be more effective and efficient because of the learning process from the current activities. An example of this learning process is demonstrated with the STATE system which will replace RAPS in the air program. RAPS had extremely heavy data collection effort and data analysis was not performed to any great extent until now. The STATE system, which will perform a similar function, will have more data analysis and modeling activities early in the program to control the amount of data collected and to interpret these data while it is being collected.

The telecommunication workload for the current and future activity was developed by individual ADP activity. High and low speed terminal activity was distributed by user location (telephone area code and zip code). Values were then accumulated for each location and summarized by region. The workload of the two computer facilities, WCC and NCC, were separately identified. The distribution factors developed from the current year data were then used to project future workload for each period.

SECTION 3

CURRENT TELECOMMUNICATIONS WORKLOAD

3.1 INTRODUCTION AND SCOPE

This section presents the current year (1977) telecommunications workload for existing ADP activities processed on timesharing facilities at the Washington Computer Center (WCC) and the National Computer Center (NCC). The workload is organized by major geographic area corresponding to EPA facilities and other users located within the ten regional office jurisdictions for the nation, and centers of high telecommunications activity in the Washington, D.C. metropolitan area and the Research Triangle Park (RTP), North Carolina area. Discussions of ADP and telecommunications activities are supported by definitions of the missions and programs for each EPA facility located within the geographic areas. Graphs are included for each geographic area showing telecommunications workload in utilizing timesharing facilities at WCC and NCC. In addition to the workload analysis by geographic area, a summarization of EPA telecommunications workload in total is presented, plus an analysis of why an EPA telecommunications network exists and why it is structured in its present form.

3.2 WORKLOAD FACTOR DEFINITIONS

Telecommunications workload is presented in this section in volume of characters transmitted between user locations and WCC/NCC timesharing facilities. These figures were based upon Optimum Systems Inc. (OSI) and NCC utilization accounting systems for seven months of operating history at OSI and eight months at NCC, ending in May, 1977. The figures were averaged to provide a typical monthly workload figure for each ADP activity and geographic location. Other areas of workload collected for each activity and location are presented in summary form for each major geographic area in the Appendix (Volume III) and include terminal connect time, input/output transaction volumes, and input/output character volumes for high and low speed transmission values.

3.3 EPA TELECOMMUNICATIONS NETWORK RATIONALE

The EPA telecommunications network has been developed over the years to provide ADP services to geographically dispersed organizational units from the two primary computing facilities at the Washington Computer Center (WCC-COMNET/OSI) and the National Computer Center (NCC) at Research Triangle Park, North Carolina. Through the use of terminals, all locations remote from the computer sites have been able to operate ADP systems on an equal footing, subject to connecting line speeds and terminal types employed. The background or rationale for the current telecommunications network design can be examined from three aspects: why EPA is organized and geographically dispersed as it is, how ADP is utilized from locations remote from the computer, and why the network is structured as it is. These aspects are discussed in the following subsections.

3.3.1 EPA Organization

The agency was organized initially from existing departments and agencies as presented in the President's Reorganization Plan of July 9, 1970. When EPA became a functioning agency in December, 1970, five Assistant Administrator areas were organized along program and functional lines, all operating from the Washington headquarters. These five AA level areas included:

- Water and Hazardous Materials: program offices for water and pesticides were organized under existing legislative mandates: Water Pollution Control Act of

1956, Clean Water Restoration Act of 1966, Water Quality Improvement Act of 1970, and the Federal Insecticide, Fungicide, and Rodenticide Act of 1947

- Air and Waste Management: program offices for air, noise, radiation, and solid waste were structured under provisions of Clean Air Act Amendments of 1970, Atomic Energy Act of 1954, Public Health Service Act, Solid Waste Disposal Act of 1965, and the Resource Recovery Act of 1970
- Enforcement: program offices for monitoring of compliance to standards for air, water, pesticides, radiation, noise, and solid waste were organized under mandates of legislation enabling standards setting and enforcement activities
- Research and Development: program offices and laboratory facilities were organized under mandates of the various major Congressional acts supporting the development and enforcement of regulations and standards over air, water, land use, energy, industry, health effects, and compliance monitoring
- Planning and Management: program offices were organized in response to administrative and support requirements in order to serve the financial and resource management operations of the entire agency

To ensure that EPA is responsive to environmental problems throughout the nation, ten Regional Offices were established to serve all geographic areas nationwide. This geographic dispersion was also consistent with the President's goal of decentralizing Federal government services in 1970 and provided closer control over programs of state and local government monitoring and assistance. It is noteworthy that the ten regional administrators report directly to the EPA Administrator. This illustrates the importance of regional activities within the EPA mission.

Many of the current laboratory facilities were merged into the agency from existing operations within other agencies and departments, such as the Gulf Breeze, Florida Biological Laboratory under Department of the Interior. With the transfer of these research and development facilities under the President's Reorganization Plan, EPA became even more geographically dispersed. Currently over 40 R & D facilities serve agency needs in locations throughout the nation, although some clustering of laboratories is evident in Cincinnati and Research Triangle Park. Some dispersal of R & D activities has been since caused by the need for adjacency to project testing areas, such as in the Great Lakes, Chesapeake Bay, etc.

With the enactment of new legislation over the years since 1970, the original organizational design has largely held up. Some reorganization has been necessary, however, such as the creation of a new AA level office for Toxic Substances under mandate of the Toxic Substances Control Act of 1976.

In summary, EPA has been organized in response to programs and missions set forth in existing and new legislation. The geographic dispersion of regional offices, laboratories, and other facilities has been caused by a combination of the transfer of existing facilities from other agencies at inception and the goal of decentralization and administration of local programs.

3.3.2 Remote ADP Utilization Modes

EPA central data processing systems provide support for local batch, remote batch, and conversational activities. These activities include regional operations, laboratory functions and national programs. Batch activities are conducted principally from remote terminals and occasionally by submitting data and job requests at the main computer sites. Conversational activities are conducted from dial-up remote keyboard terminals only.

The majority of EPA's data processing needs can be supported with batch processing. Large volume data entry, file updating, and reporting are performed as batch activities. A smaller part of these needs are supported conversationally. Most conversational tasks are either direct data entry, small volume information retrieval, or computer program development.

Remote activities require the support of terminal equipment located at the user site and a suitable telecommunications service for connecting the terminal to some authorized computer system. Remote batch is conducted with a Remote Job Entry (RJE) terminal and a high speed telecommunications line rated at 2000, 4800, 7200, 9600 or 19.2K baud. Keyboard terminals requiring a much lower line speed can also be used for initiating remote batch jobs and for direct data entry or other conversational tasks, but they are not suitable for receiving large amounts of printed material from the computer. Low speed lines are rated under 2000 baud, predominantly 30 or 120 characters per second. Another type of terminal now gaining wide acceptance is the keyboard/ graphics device capable of handling conversational activities and receiving computer output for graphics display on a viewing screen or on paper. These graphics terminals require telecommunications service with line speeds in the medium range.

3.3.3 One EPA Network Design Strategy

Effective telecommunications network design provides for timely and efficient service at a reasonable cost. The requirement for EPA includes a user community of nationwide geographic dispersion, and computer support systems in two locations several hundred miles apart. The computer systems are a Univac 1110 and an IBM 370/168, located at Research Triangle Park in North Carolina and at COMNET in Washington, D.C. respectively. Both manufacturers provide broad data communications capability, but share very little in hardware and software design philosophy.

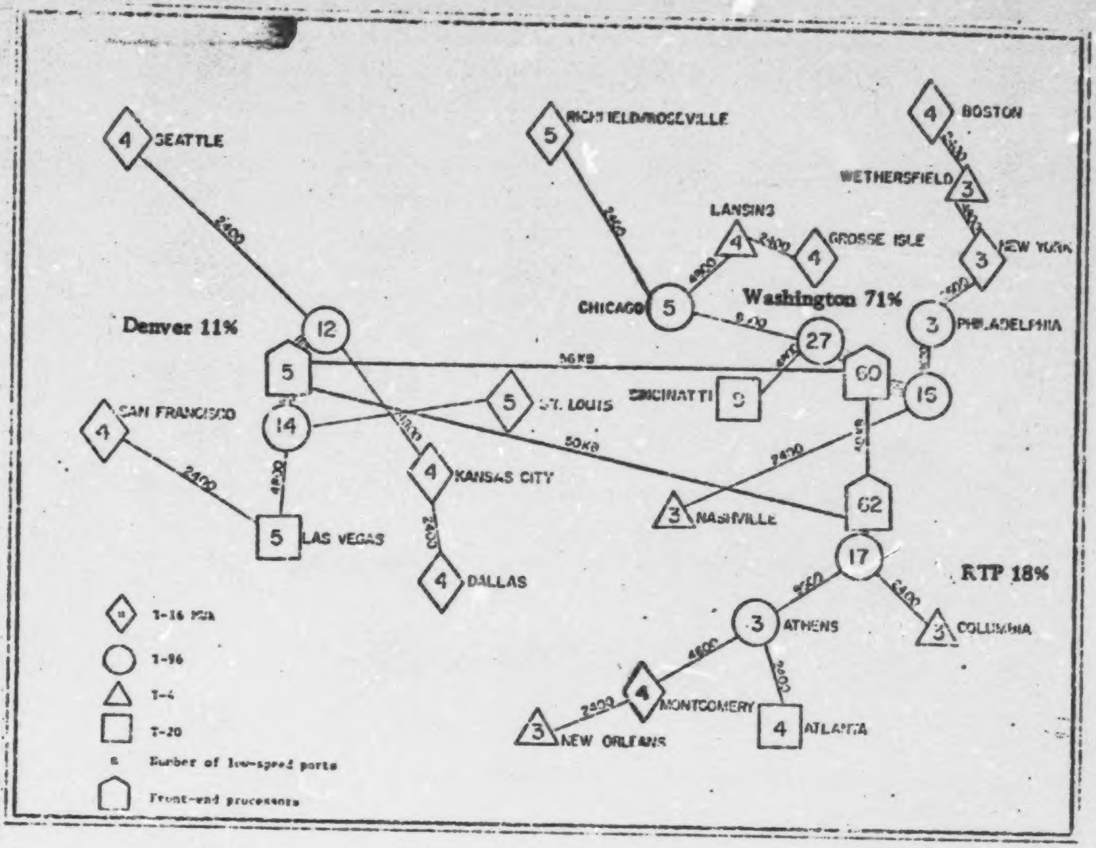
Front-end processors located at RTP and Washington, and a similar processor located in Denver, form a three node network servicing high and low speed requirements. The Denver communications processor and trunk lines provide back-up for the line between RTP and Washington by rerouting over either of the other two trunk lines. Multiplexors are used to economize on line costs for low speed use, and WATS service is employed wherever it is cost effective.

The communications processors located at RTP, Washington, and Denver serve in multiple-function capacities. They act as front-ends for EPA computer systems, as routing directors, and as concentrators or nodes in the network. The three nodes are located in areas of the country where work load levels are highest, and where network analysis indicates multiplexed feeder trunks and wide band service economies can best be achieved. Figure 3-1 illustrates the current network design for low speed and another for high speed circuits. The percentages shown next to the city name represent the portion of line utilization targeted at that particular node.

Multiplexors located in the field are used to combine multiple low speed circuits for continued routing to a common destination over a single circuit. Cost benefits are achieved by reducing the number of circuits required, while providing the necessary number of data paths necessary to satisfy terminal needs. Multiplexors are placed in locations optimized through network analysis. As of this date, considerations are being made for further optimization to meet changing requirements.

FTS and other telecommunications services are employed outside the WCC/NCC network for access to outside computer systems, and from users outside EPA to the two main EPA computer systems. A list of computer systems used which are outside EPA appears in Figure 3-2.

LOW SPEED NETWORK



HIGH SPEED NETWORK

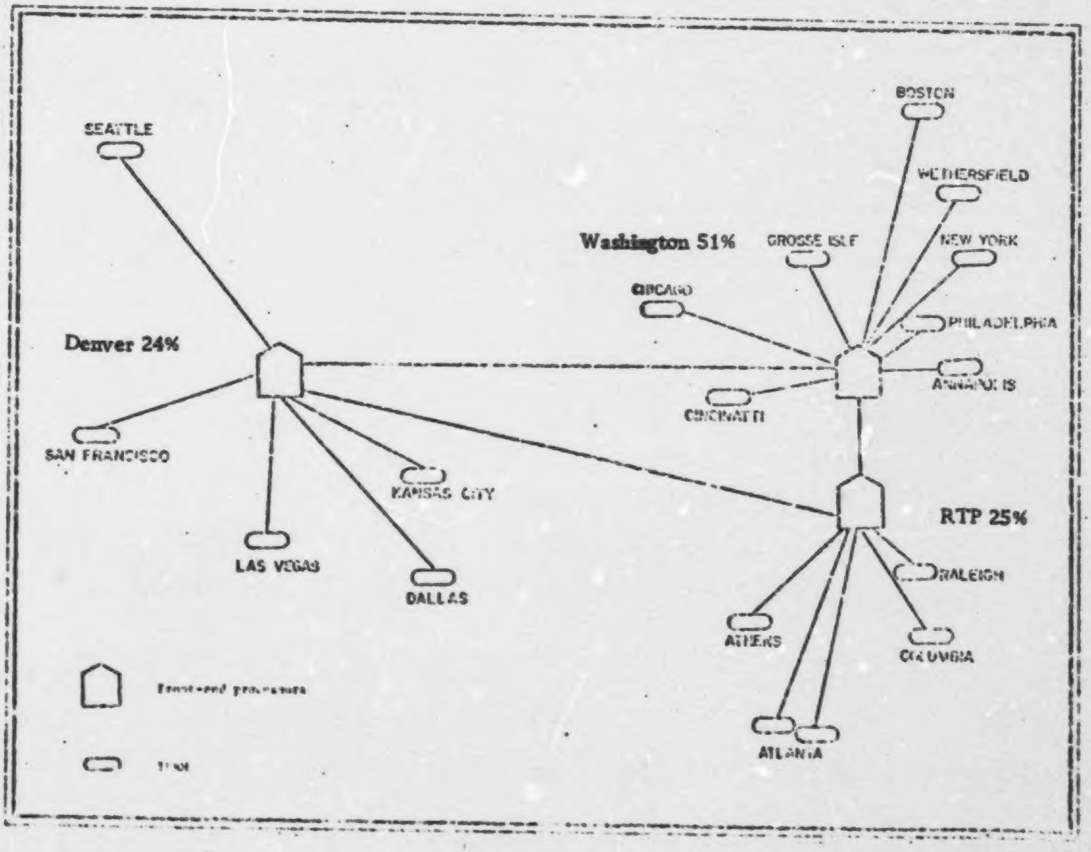


Figure 3-1

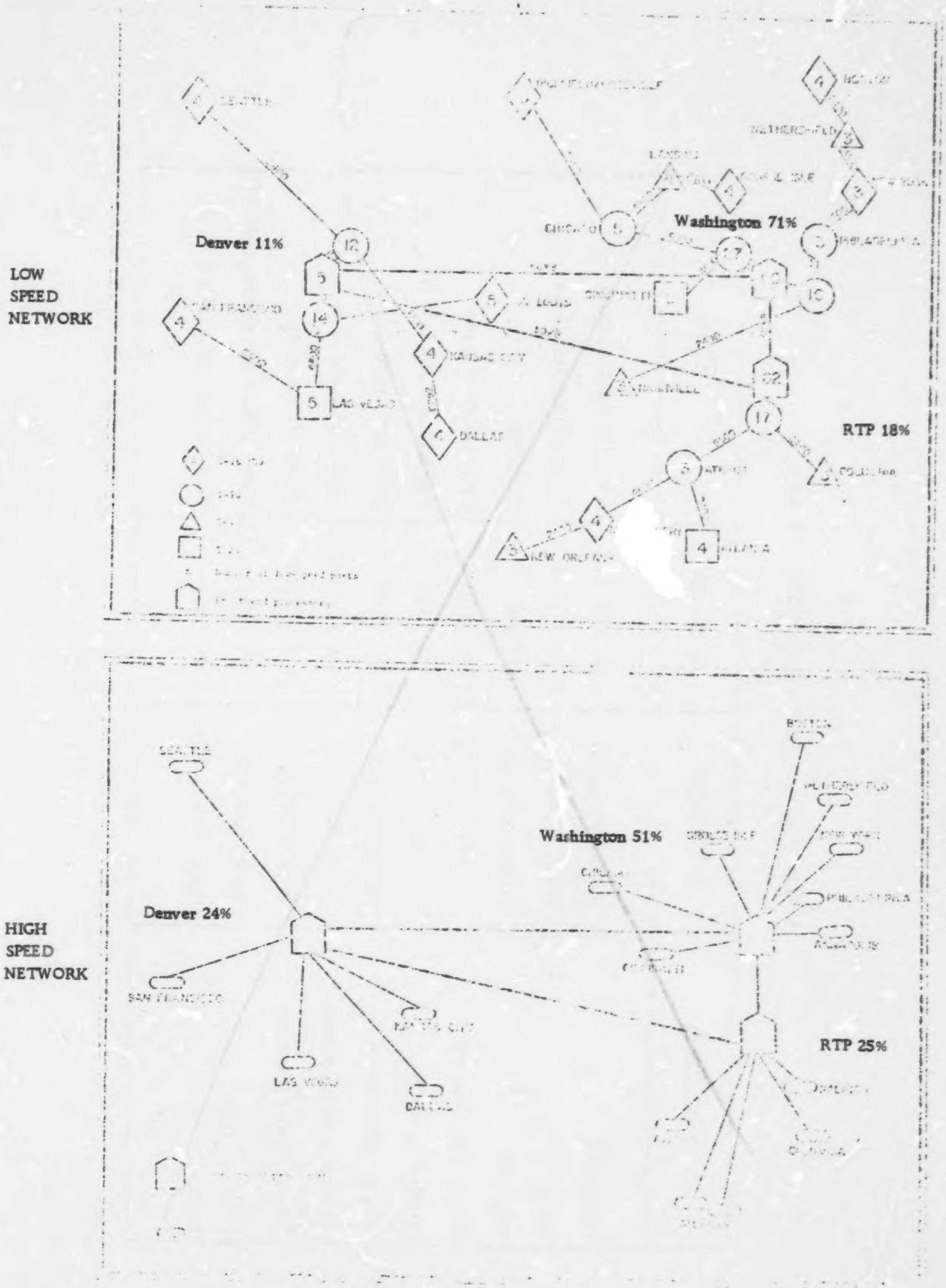

LOW SPEED NETWORK
Denver 11%
Washington 71%
RTP 18%
SEATTLE
WETHERSFIELD
NEW YORK
PHILADELPHIA
LANSING
CHICAGO
ST. LOUIS
SAN FRANCISCO
KANSAS CITY
LAS VEGAS
DALLAS
CINCINNATI
ATHENS
COLUMBIA
NEW ORLEANS
ATLANTA
12
5
14
4
5
17
10
32
2400
HIGH SPEED NETWORK
Denver 24%
Washington 51%
RTP 25%
SEATTLE
SAN FRANCISCO
LAS VEGAS
KANSAS CITY
DALLAS
BOSTON
WETHERSFIELD
NEW YORK
PHILADELPHIA
CHICAGO
CINCINNATI

Figure 3-1

TIME SHARING SERVICES USED BY EPA

Services	Location	Processor	Uses
COMNET	Washington D. C.	IBM 370/168	General Applications
NCC	RTP, N. C.	Univac 1110	General Applications
Interior	Washington D. C.	IBM 370	Payroll
ERDA Laboratory	Livermore, CA	CDC 7600	ORD Laboratories
Oregon State U	Corvallis, Ore.	CDC 3300	Corvallis Laboratory
ERDA Laboratory	Berkeley, CA	CDC 7600	ORD Laboratories
Triangle Univ. Comp. Center	RTP, N. C.	IBM 370/165	ORD Laboratories
Bowne Time Sharing	New York, N. Y.	IBM 370/158	Word Processing
NIH	Bethesda, Md.	DEC System 10	Lab. Data Processing (MLAB)
ERDA	Las Vegas, Nev.	CDC 6400	Las Vegas Laboratory

Figure 3-2

3.4 CURRENT TELECOMMUNICATIONS WORKLOAD ANALYSIS

The following subsections define EPA facilities and ADP users within each major geographic area, including the ten regional office areas, Washington, D.C. and Research Triangle Park (RTP) areas. ADP activities supporting mission programs are described in the context of their supportive role and utilization of telecommunications facilities. Total EPA current workload is presented first with each major geographic area following. Graphs are included showing current telecommunications workload by organization in utilization of WCC and NCC computer facilities.

3.4.1 Total EPA

EPA has been organized in response to programs and missions mandated by legislation. The geographic dispersion of regional offices, laboratories, and other facilities has been caused by the transfer of existing facilities from other agencies at the time EPA started in 1970, and by the need to decentralize research, monitoring, and assistance programs to the local level.

Surveys of current communications workload focused on data transmission traffic between WCC/NCC computing facilities and user locations in each of the ten regions, plus the concentration of users at EPA headquarters in Washington, D.C. and at Research Triangle Park (RTP), North Carolina. The current communications workload defined for these areas became the baseline for measuring future projected workload.

The following summarizes major ADP activities impacting current (1977) communications workload for each of the twelve geographic areas (ten regions plus Washington, D.C. and RTP). Figure 3-3 shows total communications volume for each geographic area.

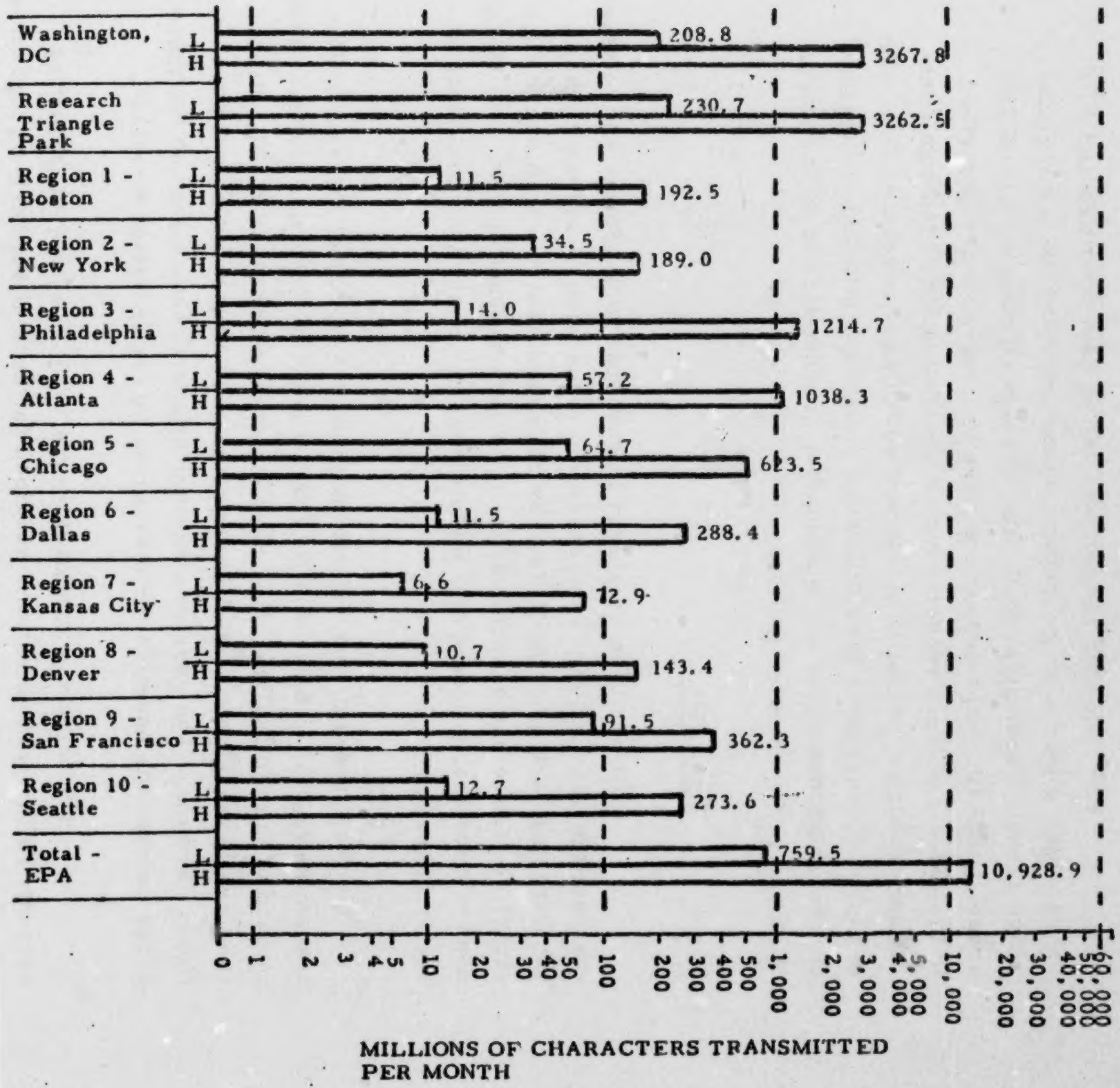


Figure 3-3. Total EPA Communications Workload - 1977

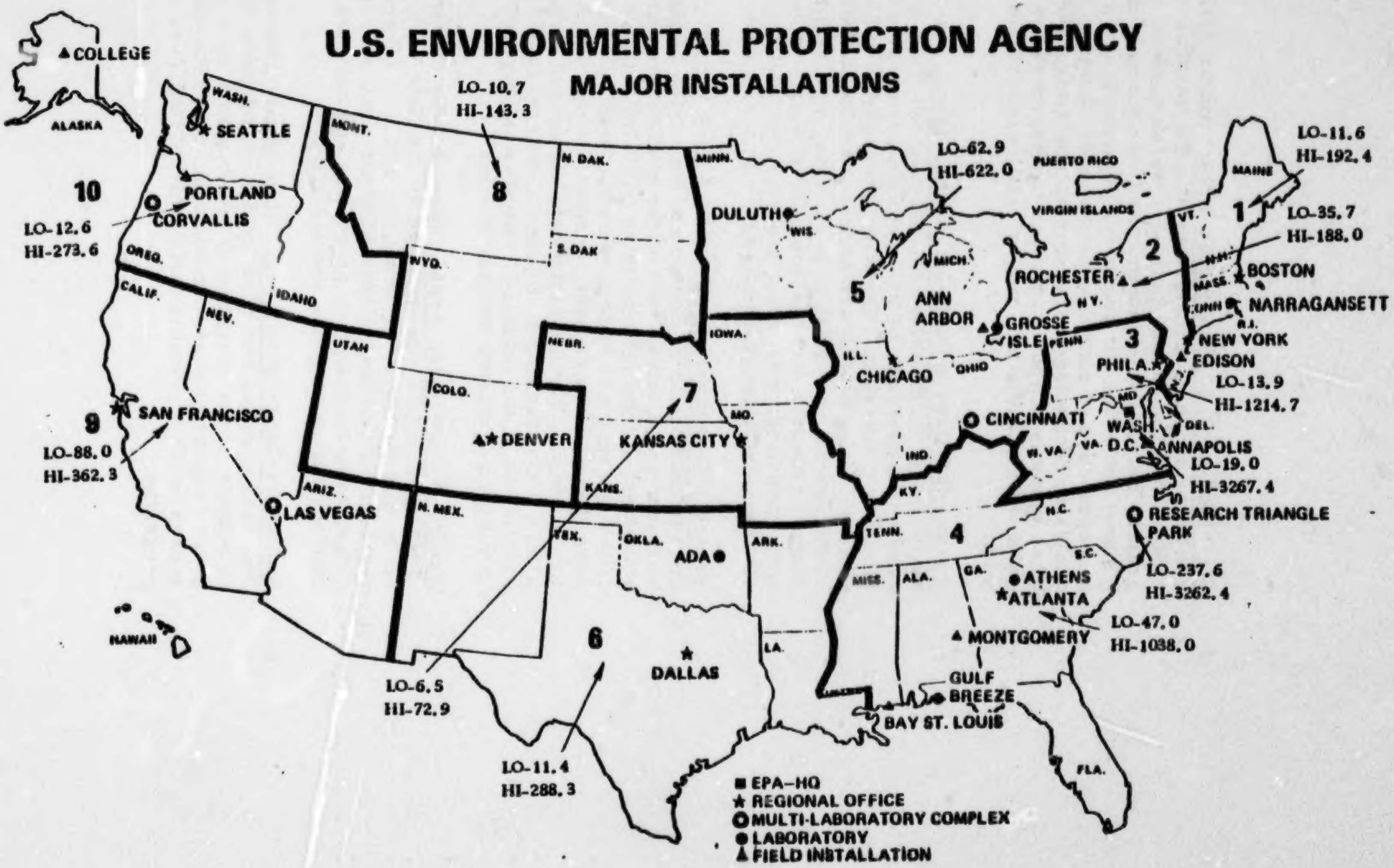


Figure 3-3.1. Current Telecommunications Workload Distribution (in Millions of Characters Monthly)

- Washington, D.C. Geographic Area: major ADP activities supporting programs at EPA headquarters center on national data bases for water quality, pesticides, grants control, water supply, and enforcement monitoring. Support activities for property, personnel, and financial management are also heavily utilized. Various economic analysis, technology assessment, modeling, and statistical systems support activities in programs for noise, solid waste, radiation, toxics, and research and development

- Research Triangle Park Geographic Area: major ADP activities at RTP involve the national air quality data base and a diversity of research programs at the RTP laboratory complex. The four laboratories (ESRL, IERL, HERL, EMSL) are concerned with studies in air contaminants, air quality, pesticides, and pollution control networks and operate ADP systems in data collection, modeling, statistical analysis, technology and environmental assessment, and monitoring activities

- Region I Geographic Area: major ADP activities for the regional office in Boston and the states of Maine and Vermont are involved with water quality monitoring and planning functions utilizing STORET. Other regional office systems are in programs for pesticides, air quality, compliance, enforcement, grants control, and administrative support. The Environmental Research Laboratory (ERL) at Narragansett, Rhode Island operates ADP systems in ocean disposal, sample analysis and others in support of marine estuary studies

- Region II Geographic Area: water quality systems utilizing STORET are operated by the New York regional office and the states of New York and New Jersey. The regional office also utilizes ADP for programs in pesticides, enforcement, grants control, compliance, administrative support, and air quality

- Region III Geographic Area: all national systems and several Regional systems are used by the Philadelphia Regional Office in support of the execution of the Region's environmental program responsibilities. In addition, non-EPA users are grantec access to EPA systems (primarily STORET) to support their programs

- Region IV Geographic Area: the Atlanta regional office and the states of Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee are users of the STORET water quality data base for regional water quality monitoring and planning. The regional office also utilizes ADP for program support in compliance, air quality, grants control, and pesticides. Environmental Research Laboratories (ERL) at Athens, Georgia and at Gulf Breeze, Florida operate ADP systems for water planning models and coastal ecosystem studies

- Region V Geographic Area: water quality monitoring and planning functions are performed with the STORET system by the Chicago regional office and the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana, and Ohio. Regional office programs impacting ADP and communications workload also include compliance, grants control, pesticides, and air quality systems. A complex of four ORD laboratories at Cincinnati, Ohio (MERL, IERL, HERL, EMSL) operate ADP systems in studies on water supply, hazardous waste, pollution control, pollutant health effects, and quality assurance standards for data collection activities. ERL facilities at Duluth, Minnesota and Grosse Ile, Michigan use ADP and the STORET system in support of Great Lakes studies. The Office of Mobile Source Air Pollution Control in Ann Arbor, Michigan utilizes WCC for general ADP support functions

- Region VI Geographic Area: the regional office in Dallas, Texas and the states of New Mexico, Texas, Oklahoma, and Arkansas utilize the STORET system for regional water quality monitoring and planning functions. The regional office also utilizes national systems for compliance, grants control, pesticides, enforcement, and air quality monitoring. The ERL at Ada, Oklahoma operates ADP systems for water and waste disposal studies

- Region VII Geographic Area: all states in the region (Nebraska, Kansas, Iowa, Missouri) and the Kansas City regional office make use of the STORET system for water programs. The regional office makes use of national systems for pecticides enforcement, compliance, grants control, and air quality

- Region VIII Geographic Area: the Denver regional office, the National Enforcement Investigation Center (NEIC) in Denver, and the states of Montana, North and South Dakota, and Colorado utilize the STORET water quality data base for water program support. The regional office and NEIC also utilize the national air quality data base at NCC for air quality monitoring and enforcement. The regional office makes use of national systems for compliance, grants, pesticides, and property management

- Region IX Geographic Area: states of California and Arizona plus the San Francisco regional office utilize STORET in water programs. Programs in pesticides, air quality, compliance, grants are supported by national ADP systems in the regional office. EMSL at Las Vegas, Nevada operates systems in air and water quality analysis studies

- Region X Geographic Area: the STORET water quality system is utilized by Idaho, Oregon, Washington and the Seattle regional office. The regional office also makes use of national systems in air quality, grants, compliance, enforcement, water quality modeling, solid waste, and pesticides. The laboratory at Corvallis, Oregon (ERL) utilizes STORET for water research programs

The following subsections provide a more detailed description of programs and ADP activities impacting communications with WCC and NCC facilities for each of these national geographic areas.

3.4.2 Washington, D.C. Geographical Area

The Washington, D.C. geographic area encompasses EPA headquarters operations primarily located at Waterside Mall in Southwest Washington, Crystal Mall in Alexandria, Virginia and several other locations in the metropolitan area.

EPA headquarters operations center on the six Assistant Administrator (AA) level offices and most of the Deputy Assistant Administrator (DAA) level offices and divisions within each office. The following summarizes programs and ADP activities associated with communications workload for each major AA area.

- Office of Planning and Management (OPM): operates ADP activities in general administrative, financial and resource management, and grants control in support of overall EPA administrative and management assistance programs. All DAA offices and divisions are located at EPA headquarters

- Office of Enforcement (OE): ADP activities are mainly concerned with tracking of facilities and monitoring their compliance to standards and regulations in support of enforcement programs for air, water, pesticides, radiation, noise, and solid waste. All DAA offices and divisions are located at EPA headquarters with the exception of the National Enforcement Investigations Center, located in Denver, Colorado (included in the Region VIII geographic area in Section 3.4.11)

- Office of Water and Hazardous Materials (OWHM): primary ADP operations involving communications workload are concerned with development and operation of centralized data base systems for programs in solid waste, water quality monitoring (STORET), construction grants, and a series of water supply systems being developed in response to the Safe Drinking Water Act of 1974. All DAA and divisional offices are located at EPA headquarters

- Office of Air and Waste Management (OAWM): ADP systems for programs in noise and radiation are managed from the EPA headquarters location. Activities involving programs for air are operated from Office of Air Quality Planning and Standards facilities in the Research Triangle Park (RTP) area and are included in Section 3.4.3. ADP activities for the Office of Mobile Source Air Pollution Control are based in Ann Arbor, Michigan and are included in Region V geographic area, Section 3.4.8

- Office of Toxic Substances (OTS): the primary ADP activities currently supporting toxics programs are mathematical modeling and statistical analysis systems for predicting and monitoring pollutant hazard levels, and a pesticides information system (PPIS). All offices for OTS are located at EPA headquarters

- o Office of Research and Development (ORD) the majority of ADP activities for ORD are performed by over 40 laboratories in field locations such as RTP, Cincinnati, and other geographic areas. Most ADP activities at EPA headquarters are centered on administrative, management information, and technology assessment systems utilized for planning, current awareness, control of resources, and progress reporting for the considerable variety of research projects in field laboratories. All DAA level offices are located at EPA headquarters.

- o Staff Offices: ADP activities supporting EPA headquarters staff offices include systems for monitoring Federal facilities and actions for the Office of Federal Activities, and a system for the Office of Public Affairs to control mailing and circulation of news releases and other public information. All staff office ADP activities are centered at EPA headquarters.

All ADP activities at EPA headquarters are served by a combination of high speed lines with remote batch terminals and low speed lines connected to keyboard terminals. Remote batch terminals provide higher speed capability for large volume reports transmitted from WCC or NCC timesharing facilities and for other relatively large volume input data or output statistics, including graphics plotting. Low speed keyboard terminals are utilized more frequently for input of relatively small data volumes or for programming and other systems development activity.

Figure 3-4 illustrates the current communications workload associated with ADP activities within EPA headquarters operations and processed on WCC and NCC facilities.

3.4.3 Research Triangle Park (RTP), North Carolina Geographic Area

The Research Triangle Park (RTP), North Carolina geographic

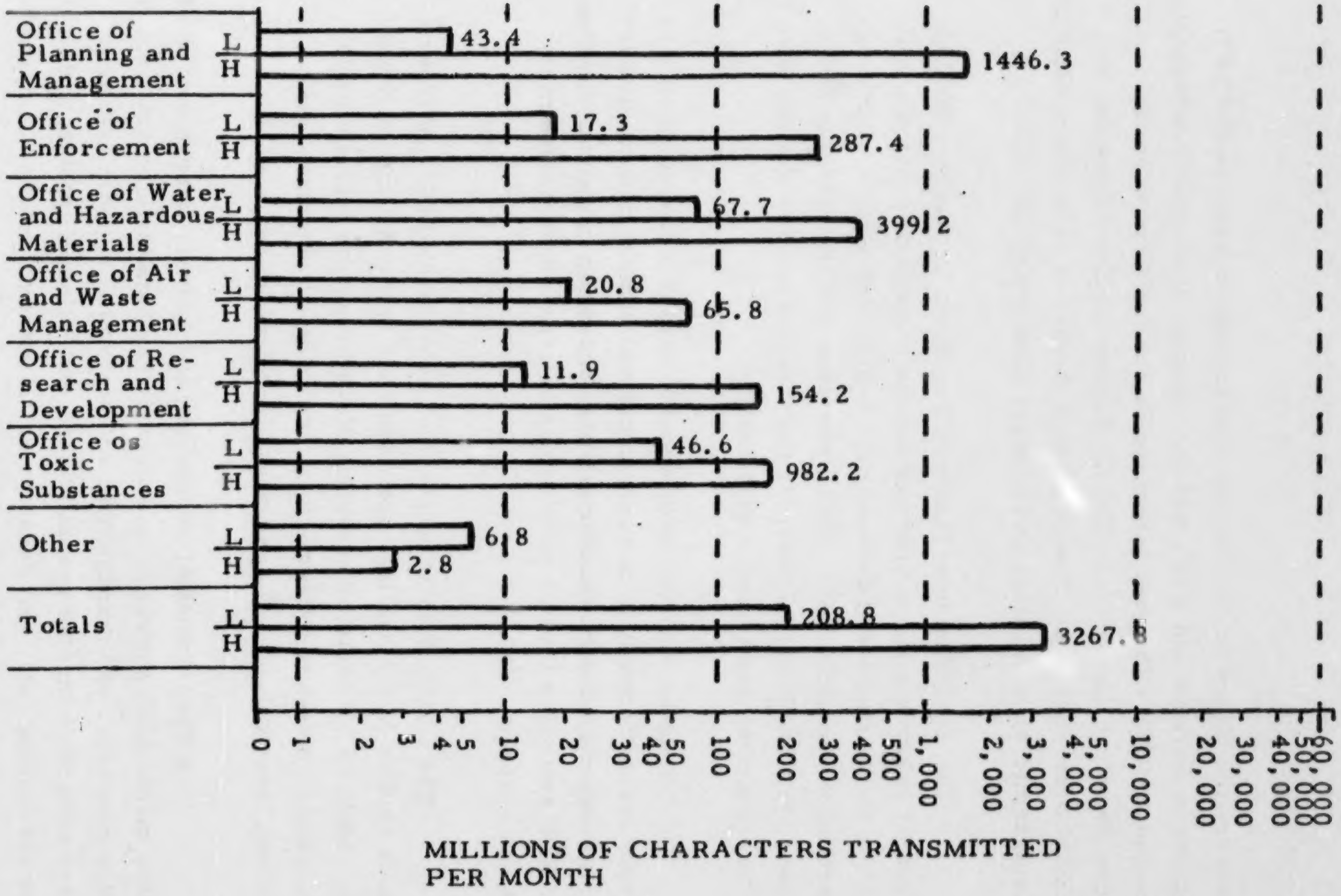


Figure 3-4. Washington, D.C. Geographic Area Communications Workload - 1977

area covers the Office of Air Quality Planning and Standards (OAQPS) operations in Durham and RTP, and the complex of four ORD laboratories located at RTP. The four laboratories are the Environmental Sciences Research Laboratory (ESRL), Industrial Environmental Research Laboratory (IERL), Health Effects Research Laboratory (HERL) and Environmental Monitoring and Support Laboratory (EMSL).

The Environmental Sciences Research Laboratory (ESRL) has several relatively large ADP systems in support of research programs for measuring and monitoring air quality and effects of gaseous and particulate air pollutants. ESRL operates the Regional Air Pollution Study (RAPS), Sulfate Transport and Transformation System (STATE) and other modeling and analysis systems.

The Industrial Environmental Research Laboratory (IERL) performs research projects in assessment and control technology for pollutants associated with electric utilities and other industrial sources. Major ADP activities include environmental assessment and particle emissions systems.

The Health Effects Research Laboratory (HERL) performs research studies in air quality, pesticides and toxics effects on human health. Major ADP systems assisting these programs include statistical analysis studies in epidemiology, mortality, community health, physiology, aerometric data, and pesticides toxicology.

The Envorinmental Monitoring and Support Laboratory (EMSL) operates major ADP activities in acquisition and analysis of non-criteria pollution networks, and management and statistical support systems. Primary programs involve evaluation and collection of ambient and source monitoring data, and development of standard methods and quality control procedures.

The Office of Air Quality Planning and Standards (OAQPS) is a DAA level organization under the Office of Air and Waste Management (OAWM). OAQPS is one of the larger users of ADP facilities and communications in EPA. The major ADP activity is SAROAD (Storage and Retrieval of Aerometric Data) which provides a national data base of air quality data, utilized by many laboratories, regional offices, states, and enforcement offices in monitoring and research activities. Other ADP activities utilized in air standards and monitoring programs include emissions inventories, trend reporting, and energy impact assessment systems.

All of the above ADP activities are utilized using a combination of remote batch services over high speed lines for large volume reporting and communications functions. Low speed lines are utilized with keyboard terminals for input of smaller volume data and for programming and other systems development activity.

Figure 3-5 presents the current communications workload for high and low speed lines by user locations in the laboratories and at OAQPS offices.

3.4.4 Region I Geographic Area

The Region I geographic area covers the Boston regional office, the Environmental Research Laboratory at Narragansett, and the states of Maine, Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island.

The Region I office in Boston provides guidance and funding under the sub-allowance system to Maine and Vermont for their use of STORET in the primary monitoring network for water quality surveillance. Analysis of water quality is performed by the region and states using STORET and user developed software. Some light use of STORET is also performed by the states of Massachusetts and New Hampshire in

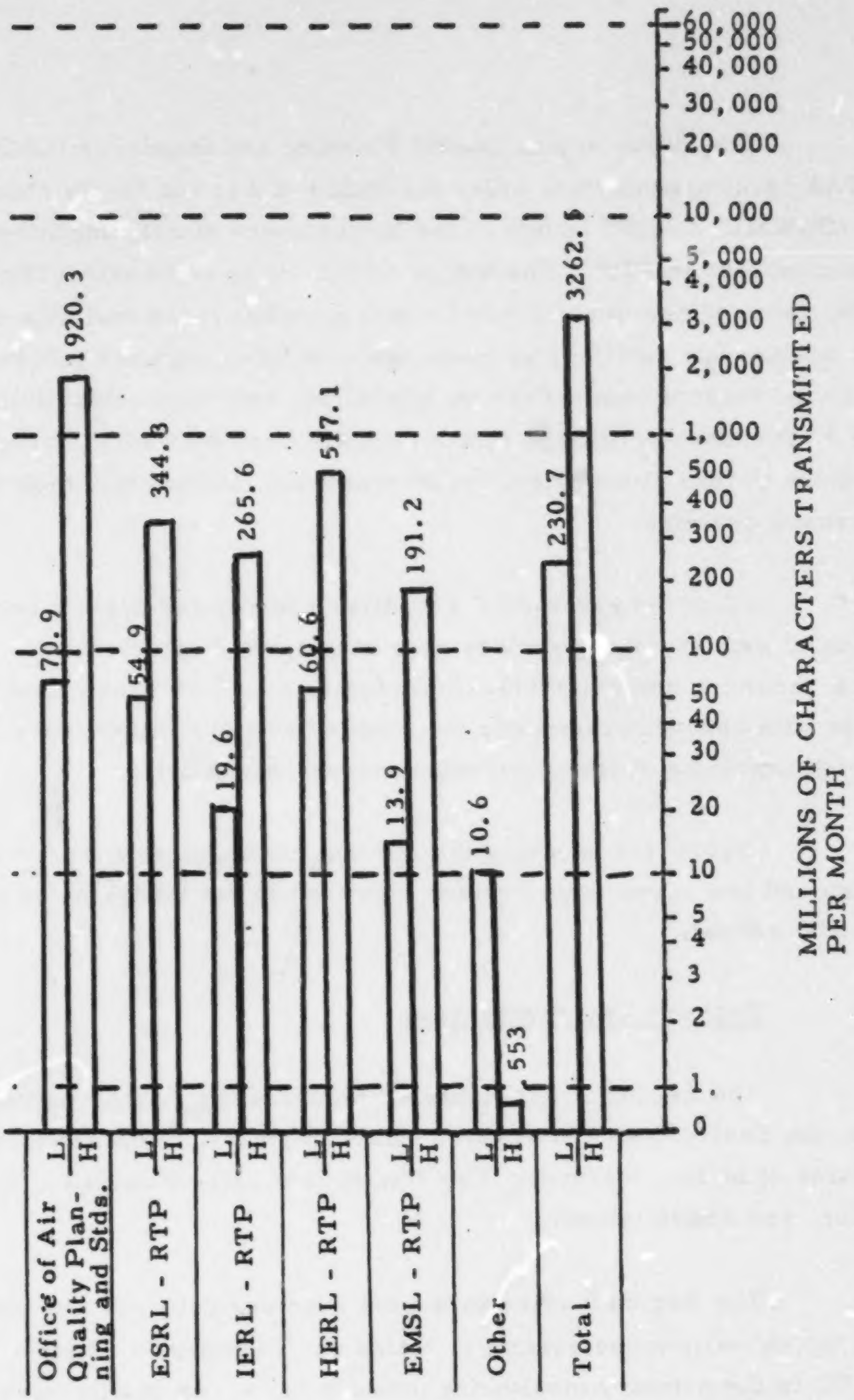


Figure 3-5. Research Triangle Park (RTP) Geographic Area Communications Workload - 1977

support of their internal water quality systems. Other national ADP systems utilized by the regional office on the WCC facility include activities for pesticides enforcement, permit compliance, grants control, property, finance, and spill prevention. National systems utilized on the NCC facilitiy are based on air quality monitoring. Additional user developed systems operated on WCC and NCC facilities include activities in air quality analysis, water supply inventory, and water analysis modeling. All of the above systems are operated in remote batch and on-line modes from Boston and state capitals to/from WCC and NCC computer facilities. Remote batch is more heavily used for reports and other large volume processing; on-line functions are primarily used for input functions.

The Environmental Research Laboratory (ERL) at Narragansett performs research on marine estuary ecosystems as impacted by pollutants, ocean dumping, and energy resource development. Minicomputers are utilized for several ADP systems and the WCC facility is used for activities in ocean disposal, administration, sample analysis, and ecosystems analysis.

Figure 3-6 shows the communications workload for the Boston regional office, ERL-Narragansett lab, states, and other Region I users, for high and low speed traffic with WCC and NCC facilities.

3.4.5 Region II Geographic Area

The Region II geographic area covers the regional office in New York City, the states of New York and New Jersey, Puerto Rico and the Virgin Islands.

New York and New Jersey utilize the STORET system in support of annual reporting and planning processes under provisions of the Federal Water Pollution Control Act. Retrieval of toxic substances

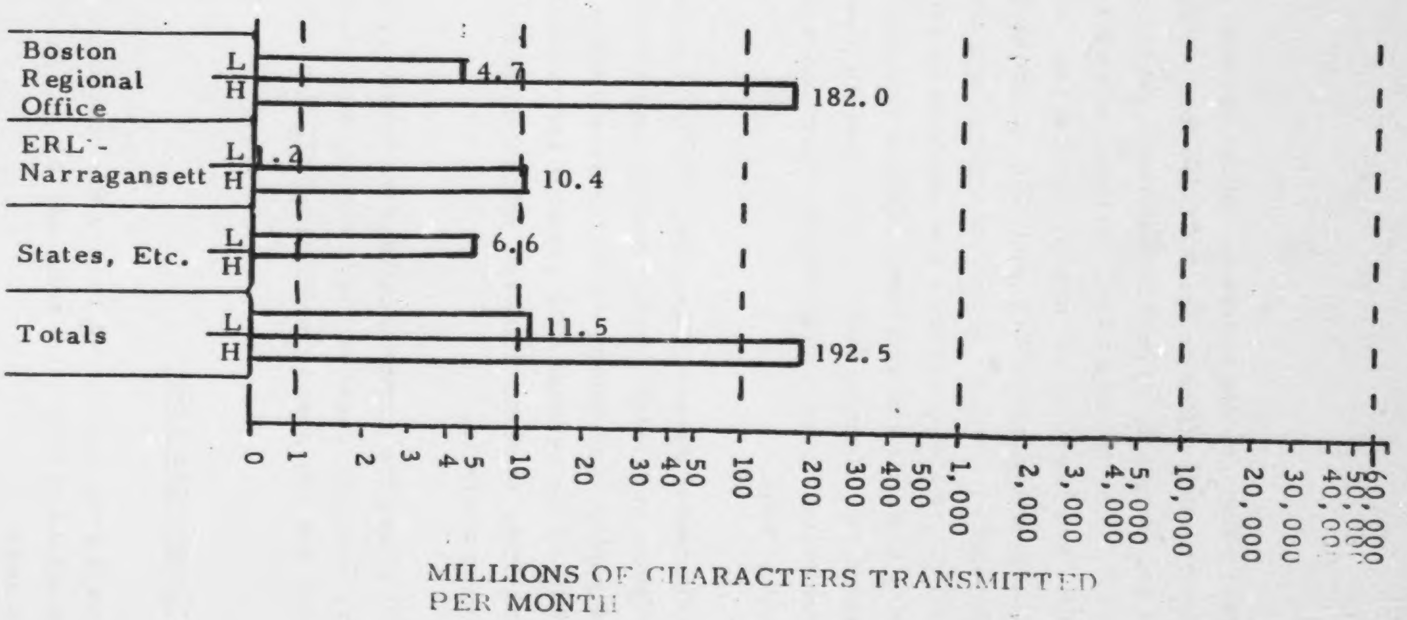


Figure 3-6. Region 1 Geographic Area Communications Workload - 1977

data is also utilized via the STORET system.

The Region II office in New York City utilizes timesharing facilities at WCC for water quality systems and other ADP activities in spill prevention, financial management, grants control, personal property, pesticides, permit development, compliance and enforcement tracking. ADP activities processed at the NCC facility include air quality and compliance monitoring systems.

All of these systems are operated in remote batch and on-line modes from New York City and state capitals at Albany, New York and Trenton, New Jersey. Remote batch operations are utilized primarily for processing of reports and other large volume functions with data transmission over high speed lines. On-line operations over low speed lines are used for lower volume data transmission of input data for file updating operations.

Figure 3-7 shows the communications workload for the New York City regional office, states, and other regional area users for high and low speed traffic with WCC and NCC computing facilities.

3.4.6 Region III Geographic Area

The Region III geographic area includes the states of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, and the District of Columbia with the Regional Office located in Philadelphia. For purposes of this study, EPA operations in the Washington metropolitan area have been treated separately in Section 3.4.2, "Washington, D.C. Geographic Area."

All national systems and several Regional systems are used by the Philadelphia Regional Office in support of the execution of the Region's

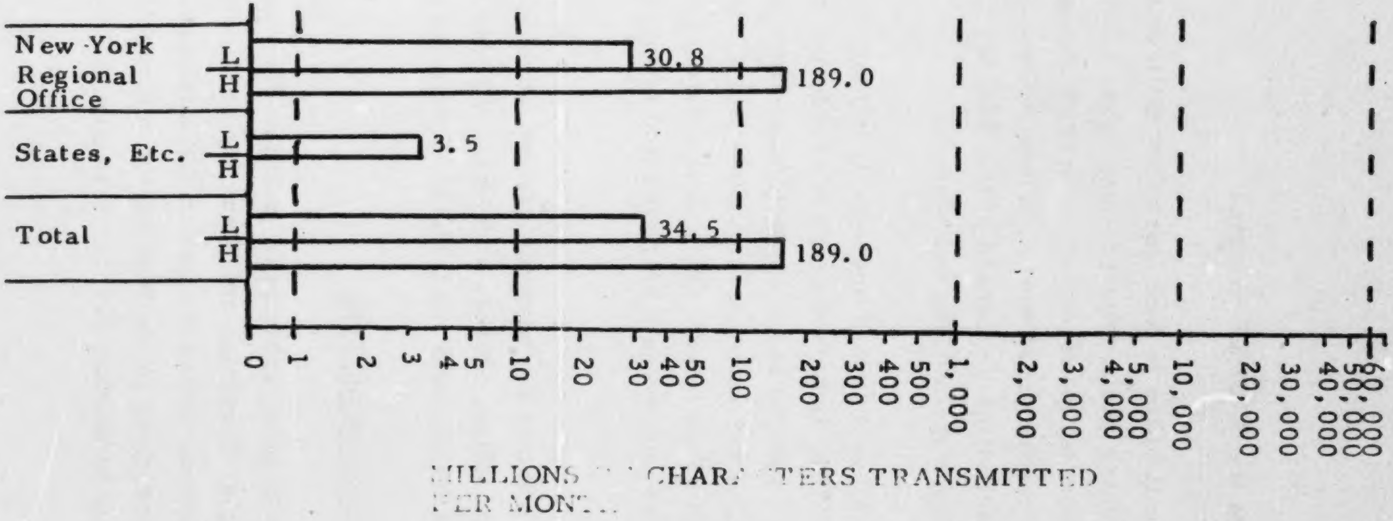


Figure 3-7. Region 2 Geographic Area Communications Workload - 1977

environmental program responsibilities. In addition, non-EPA users are granted access to EPA systems (primarily STORET) to support their programs.

All regional and non-EPA users operate all systems in remote batch and on-line modes over high and low speed lines between the user facilities and the computer facilities.

Figure 3-8 shows the communications workload for the Philadelphia Regional Office and non-EPA users (states and other governmental users) between the user locations and the WCC/NCC facilities.

3.4.7 Region IV Geographic Area

The Region IV geographic area includes the regional office in Atlanta, the Environmental Research Laboratory (ERL) at Athens, Georgia, the Environmental Research Laboratory (ERL) at Gulf Breeze, Florida, and the states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, and Tennessee. For purposes of this study, EPA operations in the Research Triangle Park (RTP) area of North Carolina have been covered separately in Section 3.4.3, "Research Triangle Park Geographic Area."

STORET is utilized by all states except Alabama for water quality modeling programs, wasteload allocations and state permit programs, annual reports to Congress, and in the continuing water planning process under Section 208 of the Federal Water Pollution Control Act. The Region IV office in Atlanta utilizes NCC for air programs and the WCC facility for regional systems in compliance monitoring, grants control, pesticides, and permit compliance. A minicomputer system in the regional office performs preprocessing of input data for national data bases and handles several administrative support systems.

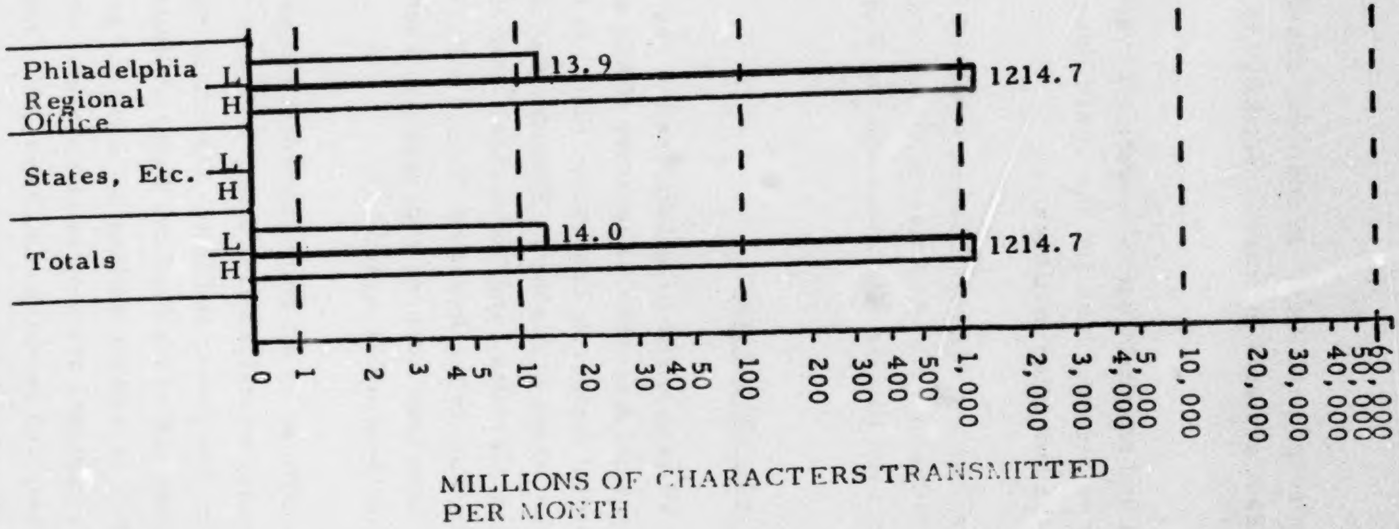


Figure 3-8. Region 3 Geographical Area Communications Workload - 1977

The Environmental Research Laboratory (ERL) at Athens, Georgia performs a variety of ADP activities with watershed and basin planning models utilizing a combination of EPA timesharing facilities and a local minicomputer system. The Environmental Research Laboratory (ERL) at Gulf Breeze, Florida makes limited use of ADP systems for modeling and statistical analysis in coastal and estuary ecosystem studies.

All ADP operations are operated in remote batch mode for large volume reports and other high volume functions, and in on-line mode for data input and editing functions. Communications lines are high speed for remote batch terminal operations in state capitals and the regional office. Low speed lines service lower volume communications for on-line functions and smaller volume users.

Figure 3-9 illustrates the current communications workload for the Atlanta regional office, states, laboratories and other regional users between WCC/NCC facilities and user locations.

3.4.8 Region V Geographic Area

The Region V geographic area covers the regional office in Chicago, the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana, and Ohio, the multi-laboratory complex at Cincinnati, Ohio (Municipal Environmental Research Laboratory, Industrial Environmental Research Laboratory, Health Effects Research Laboratory, Environmental Monitoring & Support Laboratory), the Environmental Research Laboratory at Duluth, Minnesota and Gross Ile, Michigan, and the Office of Mobile Source Air Pollution Control (OMSAPC) at Ann Arbor, Michigan.

Communications workload for state users is limited to the STORET system for water quality monitoring and planning activities.

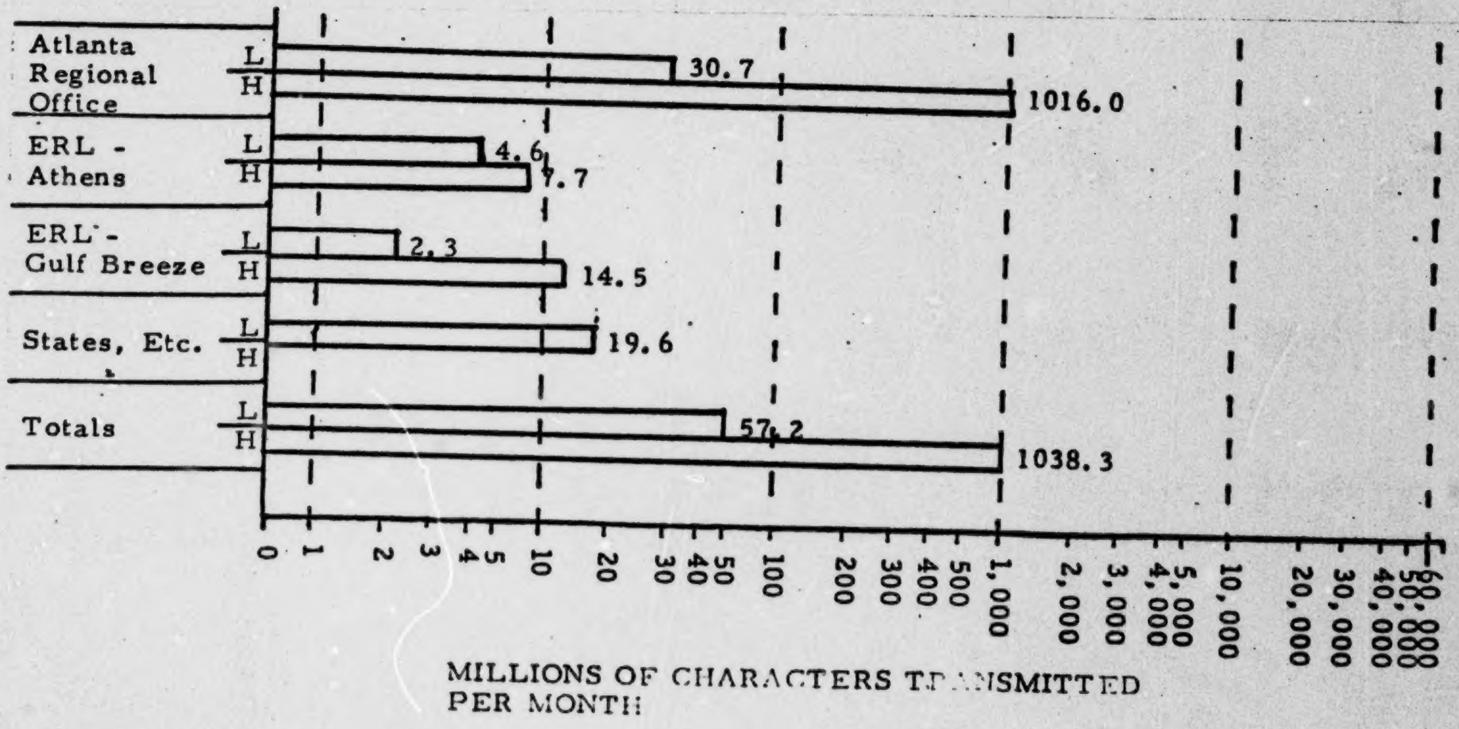


Figure 3-9. Region 4 Geographical Area Communications Workload - 1977

The regional office utilizes STORET for river basin planning and modeling analysis functions and other systems for permits compliance, grants control, pesticides, and compliance monitoring at the WCC facility. The NCC facility is utilized for air quality systems.

The Municipal Environmental Research Laboratory at Cincinnati utilizes WCC for water supply simulations, wastewater treatment data bases, and other activities supporting water and solid/hazardous waste programs. The Industrial Environmental Research Laboratory operates several ADP systems for pollution control technology in energy, mining, and manufacturing industries. The Health Effects Research Laboratory operates systems for toxicology studies involving environmental pollutant effects on health. The Environmental Monitoring & Support Laboratory develops quality assurance standards for sample collection in water programs, and advanced techniques for monitoring programs in water and energy related activities. The Environmental Research Laboratory at Duluth and Grosse Ile conducts research studies on the ecological systems in the Great Lakes using various ADP models and statistical programs. The OMSAPC office in Ann Arbor utilizes WCC for general administrative and technical support activities.

Minicomputers are employed in the regional office and several of the laboratories for performing preprocessing of input data to national data bases and for local modeling and analytical functions.

All large processing functions utilizing STORET, SAROAD and laboratory analysis systems are processed on WCC and NCC facilities in remote batch mode over high speed lines. Low speed lines are utilized for lower volume data transfer such as data input and software development activities.

Figure 3-10 shows the current communications workload for the Chicago regional office, states, laboratories, and other regional area users for traffic between user locations and WCC/NCC facilities.

3.4.9 Region VI Geographic Area

The Region VI geographic area encompasses the regional office in Dallas, Texas, the states of New Mexico, Texas, Oklahoma, Arkansas, and Louisiana, and the Environmental Research Laboratory (ERL) at Ada, Oklahoma.

All states, with the exception of Louisiana, utilize the STORET system at WCC for water quality monitoring in their primary monitoring network, annual reporting to Congress, and water planning activities. A grants control system (GICS) is also used by states on the WCC facility for tracking progress of construction grant applications. The Dallas regional office utilizes WCC facilities for systems in compliance monitoring, grants control, pesticides enforcement, permit compliance, and water quality analysis and planning. The NCC facility provides regional office services in air quality monitoring and surveillance.

The Environmental Research Laboratory at Ada, Oklahoma utilizes EPA timesharing services for supporting research programs in surface and groundwater pollutants, wastewater treatment, and waste disposal activities.

Large processing jobs involving STORET, research projects, and high volume report functions are transmitted over high speed lines

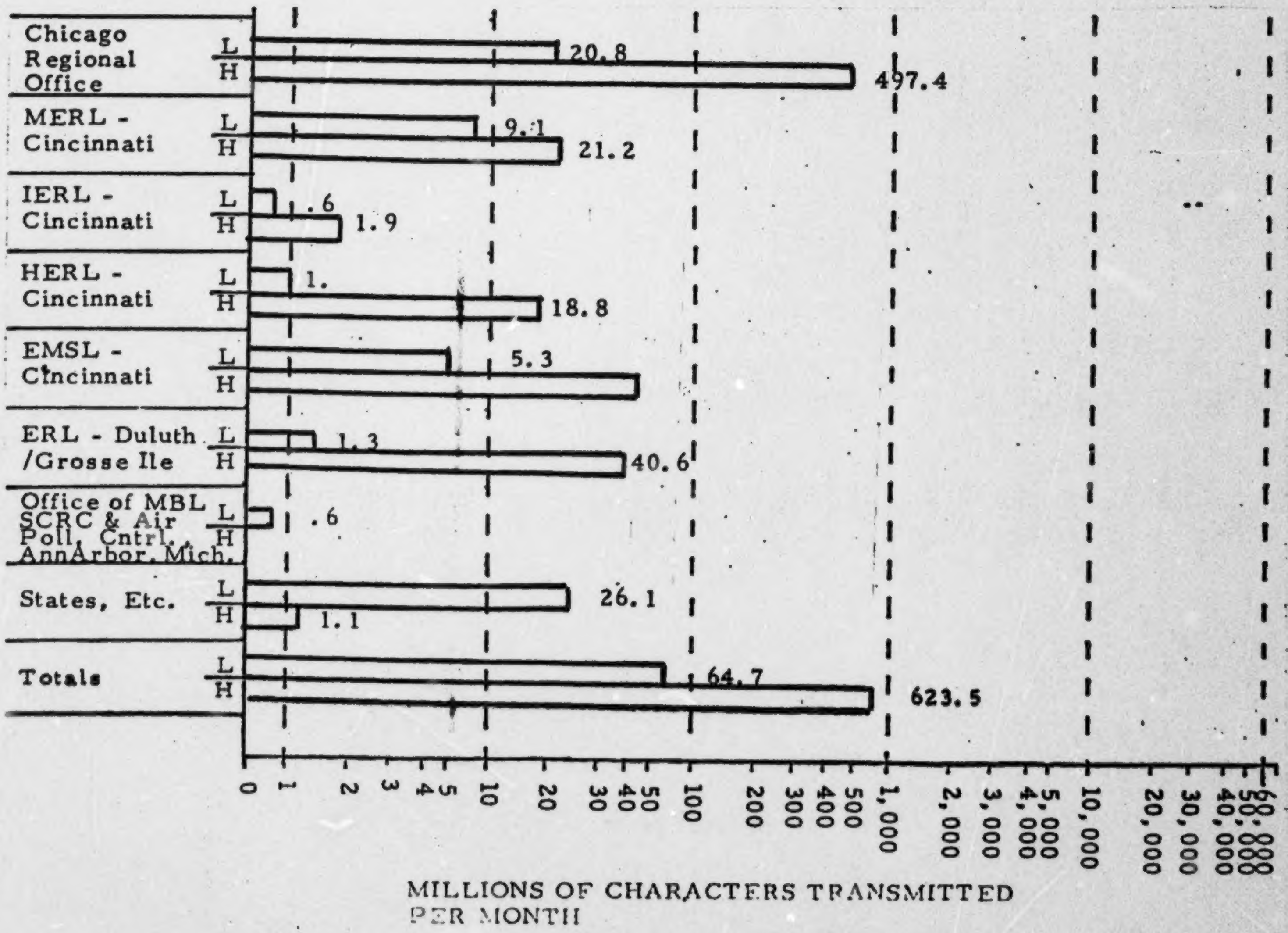


Figure 3-10. Region 5 Geographical Area Communications Workload - 1977

using remote batch terminals at the user sites in state capitals and the regional office at Dallas. Lower volume functions requiring editing are transmitted over low speed lines from keyboard terminals at user locations in states, regional office, and the laboratory.

Figure 3-11 shows the current communications workload for the Dallas regional office, states, the laboratory at Ada, Oklahoma, and other regional area users for traffic between user locations and WCC/NCC computer facilities.

3.4.10 Region VII Geographic Area

The Region VII geographic area includes the regional office at Kansas City, Missouri, and the states of Nebraska, Kansas, Iowa, and Missouri.

All states in the region utilize the STORET system at WCC for monitoring water quality, annual reporting, and planning activities under requirements of the Federal Water Pollution Control Act. The Kansas City regional office utilizes the WCC facility for programs in pesticides enforcement, compliance monitoring, grants control, permit compliance, and water quality monitoring. The NCC facility is used by the regional office for air quality and emissions monitoring. Other smaller volume ADP activities in the regional office include WCC operations in water supply, pesticides, and administrative support.

Communications workload is primarily over high speed lines for larger volume remote batch processing services in the regional office. States use a higher amount of low speed traffic for smaller volume input and reporting functions.

Figure 3-12 illustrates the current communications workload at user sites in state capitals and the regional office in transmitting data to/from WCC and NCC facilities.

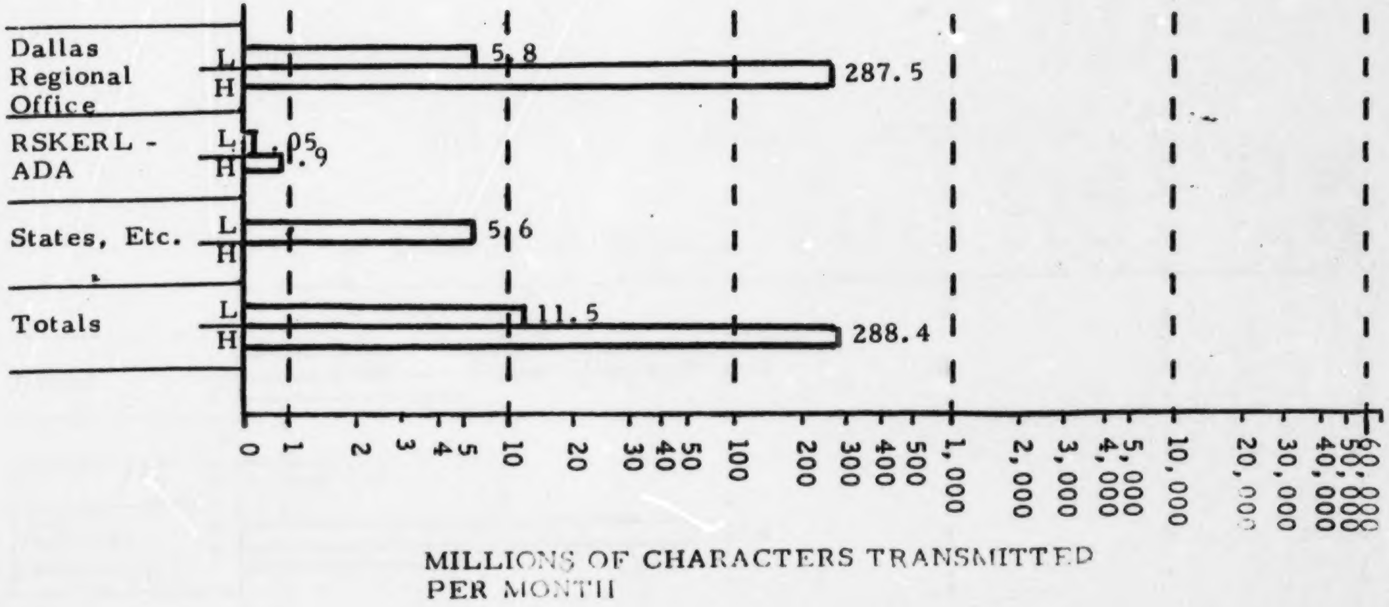


Figure 3-11. Region 6 Geographical Area Communications Workload - 1977

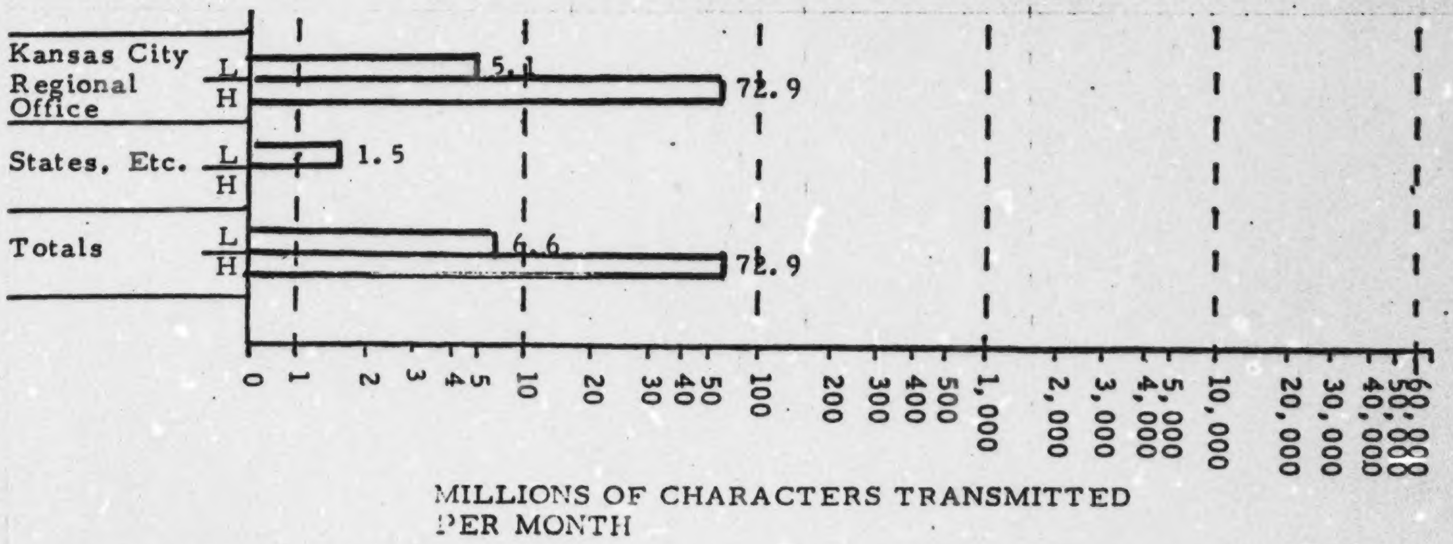


Figure 3-12. Region 7 Geographical Area Communications Workload - 1977

3.4.11 Region VIII Geographic Area

The Region VIII geographic area encompasses the regional office at Denver, Colorado, the states of Montana, Wyoming, North and South Dakota, Utah, and Colorado, and the National Enforcement Investigation Center in Denver.

All states except Wyoming and Utah utilize the STORET system at WCC for water pollution abatement and control programs under provisions of the Federal Water Pollution Control Act. The regional office and the National Enforcement Investigation Center utilize WCC systems for compliance monitoring, grants control, pesticides, personal property management, and water quality monitoring. The NCC facility is utilized for air quality monitoring and analysis activities.

Communications workload is handled over high and low speed lines from user locations, with high volume workload primarily emanating from the regional office and the enforcement center in Denver.

Figure 3-13 shows current communications workload between user locations and WCC/NCC facilities.

3.4.12 Region IX Geographic Area

The Region IX geographic area covers the regional office in San Francisco, the states of California, Nevada, Arizona, and Hawaii, and the Environmental Monitoring & Support Laboratory (EMSL) in Las Vegas, Nevada.

California and Arizona, plus some local jurisdictions utilize the STORET system at WCC in support of water planning and annual reporting under provisions of the Federal Water Pollution Control Act. Regional office use of national systems at WCC includes water quality

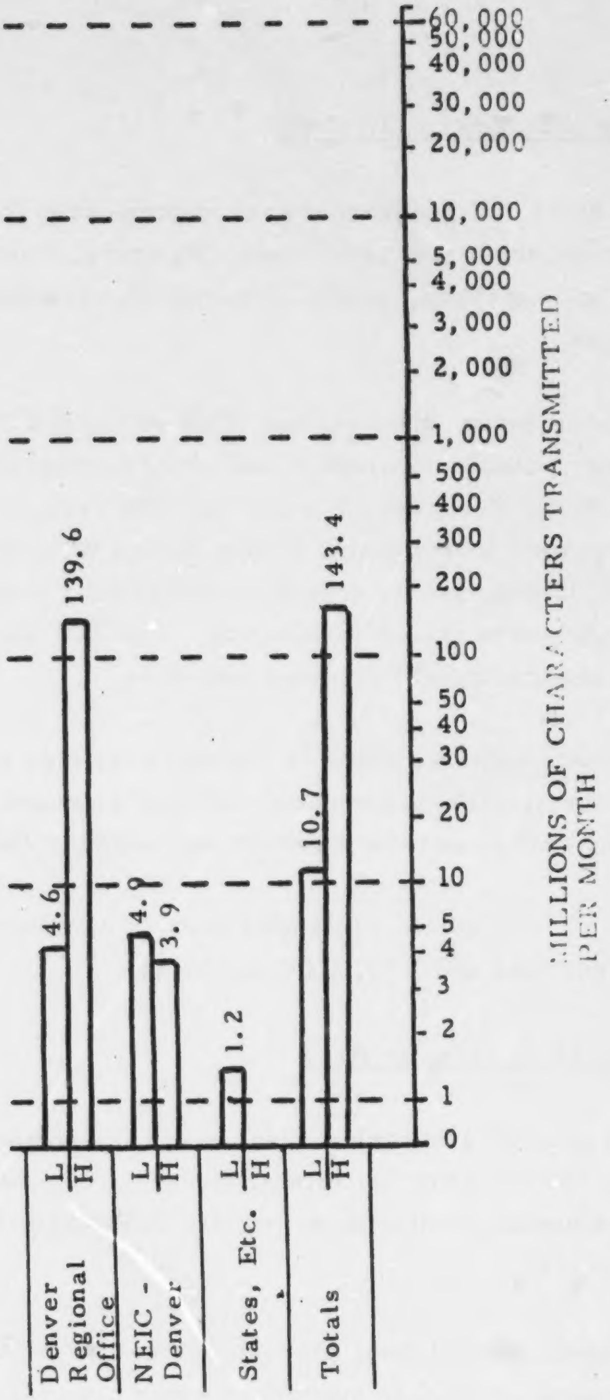


Figure 3-13. Region 8 Geographical Area Communications Workload - 1977

monitoring, pesticides enforcement, compliance monitoring, and grants control. The NCC facility is utilized for air quality tracking and modeling systems. The Environmental Monitoring & Support Laboratory at Las Vegas operates systems at WCC and NCC in air and water quality studies, laboratory management and engineering analysis activities. These systems support research projects in energy-oriented air, water, and water supply contaminants, and research in acquisition of valid environmental data.

Communications between user locations and WCC/NCC computing facilities are handled over high and low speed lines, with remote batch operations and high speed lines utilized for larger volume reporting functions and low speed lines utilized for on-line entry of input data and systems development activities.

Figure 3-14 illustrates the current communications workload for high and low speed lines between WCC/NCC facilities and user locations in the regional office, the Las Vegas laboratory, states, and other regional area users.

3.4.13 Region X Geographic Area

The Region X geographic area encompasses the regional office in Seattle, Washington, the states of Oregon, Washington, Idaho, and Alaska, and the Environmental Research Laboratory (ERL) at Corvallis, Oregon.

The STORET system is utilized at the WCC facility by Idaho, Oregon, and Washington for programs in water quality monitoring, planning, and annual reporting to Congress under provisions of the Federal Water Pollution Control Act. Alaska will begin utilization of STORET in support of similar programs in 1978. The Seattle regional office operates several ADP systems on the WCC facility in programs involving water quality monitoring and planning, grants control, permits compliance, enforcement monitoring, water quality modeling, solid waste, pesticides, and

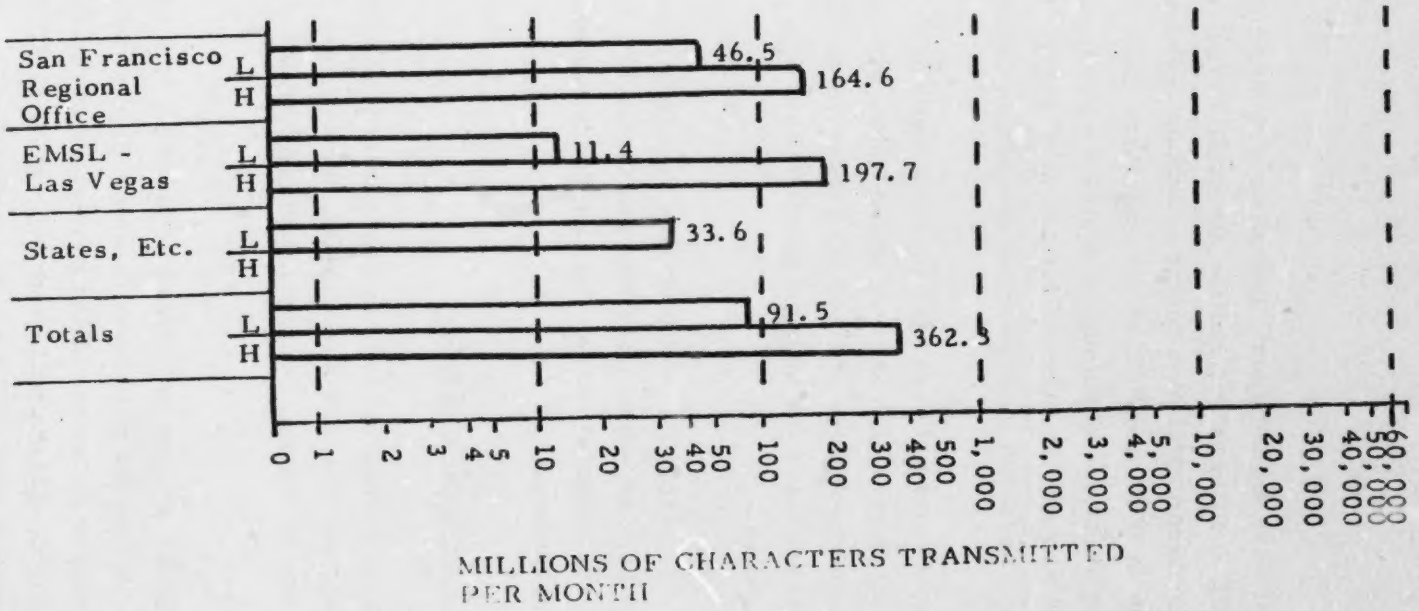


Figure 3-14. Region 9 Geographical Area Communications Workload - 1977

administrative support. The NCC facility is utilized for operation of regional air quality monitoring systems with the SAROAD air data base. The Seattle regional office currently uses a minicomputer for preprocessing of input data to national data bases, for regional water quality monitoring, and in general support activities.

The laboratory at Corvallis, Oregon operates several ADP systems in support of research studies in development of water quality criteria, proposed effluent standards, effects of pollutants, lake eutrophication, and lake surveys. The STORET water quality system at the WCC facility accounts for the majority of the communications workload for laboratory functions. Other ADP workload is currently handled by a computing facility at Oregon State University and by laboratory minicomputer systems.

Figure 3-15 shows the current communications workload for high and low speed lines between WCC/NCC facilities and user sites in the Seattle regional office, the Corvallis laboratory, states, and other local regional users.

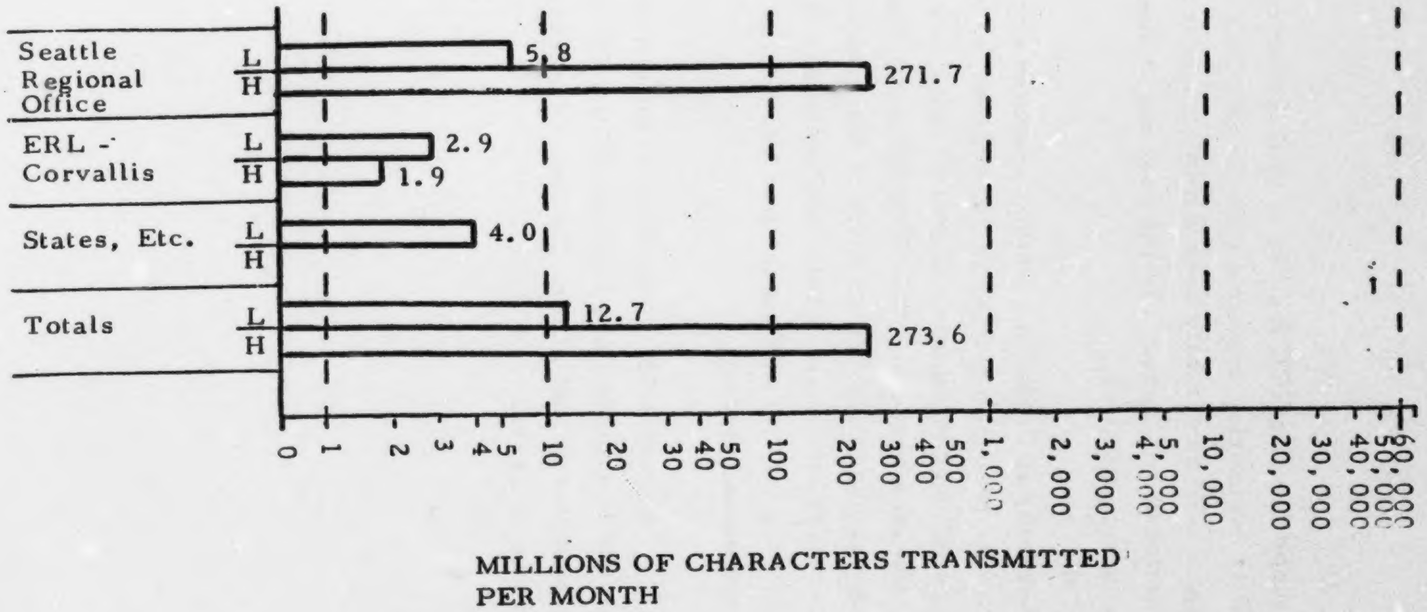


Figure 3-15. Region 10 Geographical Area Communications Workload - 1977

SECTION 4

PROJECTED TELECOMMUNICATIONS WORKLOAD

4.1 INTRODUCTION AND SCOPE

This section presents the projected telecommunications workload for 1979, 1981, 1985, and 1990 time frames. Each ADP activity impacting telecommunications that is expected by EPA management to continue during this period is included plus those new activities scheduled for implementation. Termination of those activities with life cycle end dates during the period through 1990 have also been factored into the projections. Changes in missions, programs, and ADP activities caused by legislation and evolvement of regional and state operations are analyzed by way of describing the forces behind projected ADP and telecommunications growth rates. Graphs are included to present projected workload growth for EPA in total and each of the geographic areas. Graphs also include the different rates of growth projected for each of the three future scenarios.

4.2 ALTERNATIVE SCENARIOS

Projected growth rates are presented at three levels which coincide with the three future scenarios discussed in management level interviews during the ADP survey:

- Scenario I is considered to be equivalent to today's level of activity and growth within the agency, and includes the viewpoint of the present administration, current economic outlook, energy programs, and public demands for environmental safeguards
- Scenario II considers that conditions of Scenario I will be augmented by increased public demand and legislative actions for environmental safeguards, potentially caused by increased public

awareness of environmental problems and some pollutant or toxic substance disasters of national prominence and magnitude.

- Scenario III considers the situation where shortage of critical resources such as energy, food, or water would impact agency programs with potential secondary concerns for the environment and high priorities for production of life-support resources

Discussions at the AA and DAA level focused on these three scenarios in terms of overall agency impact and effect on individual programs and ADP budgets. Management viewpoints and predictions were quantified and applied to the growth rates of individual ADP and telecommunications activities. After EPA review of the projection values, workload growth rates were finalized and computer processed, resulting in the three levels of future telecommunications growth presented in this section. Growth rates for each scenario by EPA office are listed in their quantified form in "Projections of EPA Future", Volume III, Appendix to Consolidated Systems Study. Detailed projections by telecommunications activity are available in a special report provided to MIDSD.

4.3 WORKLOAD FACTOR DEFINITIONS

Telecommunications workload for projected future periods through 1990 is expressed in the same values used for the current workload in Section 3, i.e., in volume of characters transmitted per month between user locations and WCC/NCC computing facilities. Future workload has been computed for the milestone years 1979, 1981, 1985 and 1990. This was performed in accord with the management level survey estimates that were quantified and used for projecting changes in total agency growth, program and mission levels, and changes in the rate of ADP utilization for each office.

4.4 PROJECTED TELECOMMUNICATIONS WORKLOAD ANALYSIS

The following subsections define EPA facilities and other users within national geographic areas that utilize WCC and NCC computing facilities impacting telecommunications workload in the projected period through 1990. Total EPA workload is presented first with each of twelve geographic areas following, including the ten regional areas plus Washington, D.C. and Research Triangle Park areas. Graphs are included showing projected telecommunications growth for each area under each of the three scenarios.

4.4.1 Total EPA

Agency growth in communications workload will grow throughout the projected period to 1990 under Scenario I, with higher growth rates in the period between 1977 and 1981. Sharper increases in the near term will be caused by the implementation of new programs in toxics, water supply, and solid waste, and by the impact of these programs on existing activities in pesticides, water, and enforcement. The continuing trend to decentralization will further the distribution of communications workload to the regions and states, primarily in water, air, and enforcement programs.

As decentralization continues and more regions gain increased local ADP capability, the communications growth curve is expected to rise less rapidly. The use of national data bases will continue to expand with cross-media programs such as toxics forcing increased use of shared data base concepts, but the maturation of new programs and more state responsibility in the traditional air and water programs will be offsetting factors in communications workload growth.

Growth in the Washington, D.C. area for EPA headquarters is expected to follow the general pattern of higher growth in the period to 1979 as toxics and other new programs are implemented. More moderate but continued growth beyond 1979 will be caused by continuing trends in the states and regions for more intensive use of national water and compliance data bases, offset to a certain extent by decentralized ADPcapability.

The laboratories will continue to have a heavy impact upon communications workload as most of these facilities maintain growth rates of the past and some increase growth significantly under research programs in chemical toxics and other health impact areas, quality assurance standards, energy related studies, and more intensive water programs such as in the Great Lakes. New legislation will be a continuing factor in research priorities, such as in radiation. The laboratories are heavy users of minicomputers and this trend will continue, but the need for large scale capability for modeling, statistical analysis, and other large volume processing will continue to increase communications workload.

Scenario II and higher demands for environmental programs would tend to intensify the growth rates presented for Scenario I, particularly in health effects programs and associated standards development, enforcement, and research. The decentralization trend to regions and states would increase as more local control efforts would be stressed. The impact upon communications workload would be high, more so in the early years before much local ADP capability was available at the local level.

Scenario III would selectively reduce lower priority programs in local assistance and technology development, but the overall impact upon communications would not be as great as the effect upon other elements of agency program budgets. The trend to decentralization would be slowed and research programs would be lengthened, with corresponding reductions in the rate of ADP and communications workload growth.

Figures 4-1, 4-2, and 4-3 illustrate projected EPA growth rates by geographic area for each of the three future scenarios. A more detailed presentation of each major geographic area (Washington, D.C., Research Triangle Park, the ten regions) and communications growth trends by scenario is covered in following subsections.

4.4.2 Washington, D.C. Geographic Area

The Washington, D.C. geographic area encompasses EPA headquarters operations, with primary facilities in Waterside Mall and other locations in the metropolitan area.

Under Scenario I, EPA headquarters activities impacting communications volume show a moderate increase in most program areas throughout the period through 1990 with a higher rate of growth from 1977 to 1979. Increases in the period up to 1979 are caused by the implementation of new programs in water supply, solid waste, and the toxics program in support of recent legislation in these areas.

In the period beyond 1979, these and other existing programs will mature and ADP utilization is expected to grow at a more reduced rate. Certain programs such as water and enforcement activities will shift to states and regions as their local ADP capability grows.

The following summarizes growth patterns under the various scenarios for ADP activities associated with communications workload for each major AA area.

- Office of Planning and Management (OPM): growth in communications for ADP activities will be small under Scenario I with few new activities being implemented. Growth over the near term may increase slightly as several existing activities in personnel and others are integrated. ADP utilization beyond this period will grow more slowly due to reduction of duplication in these systems

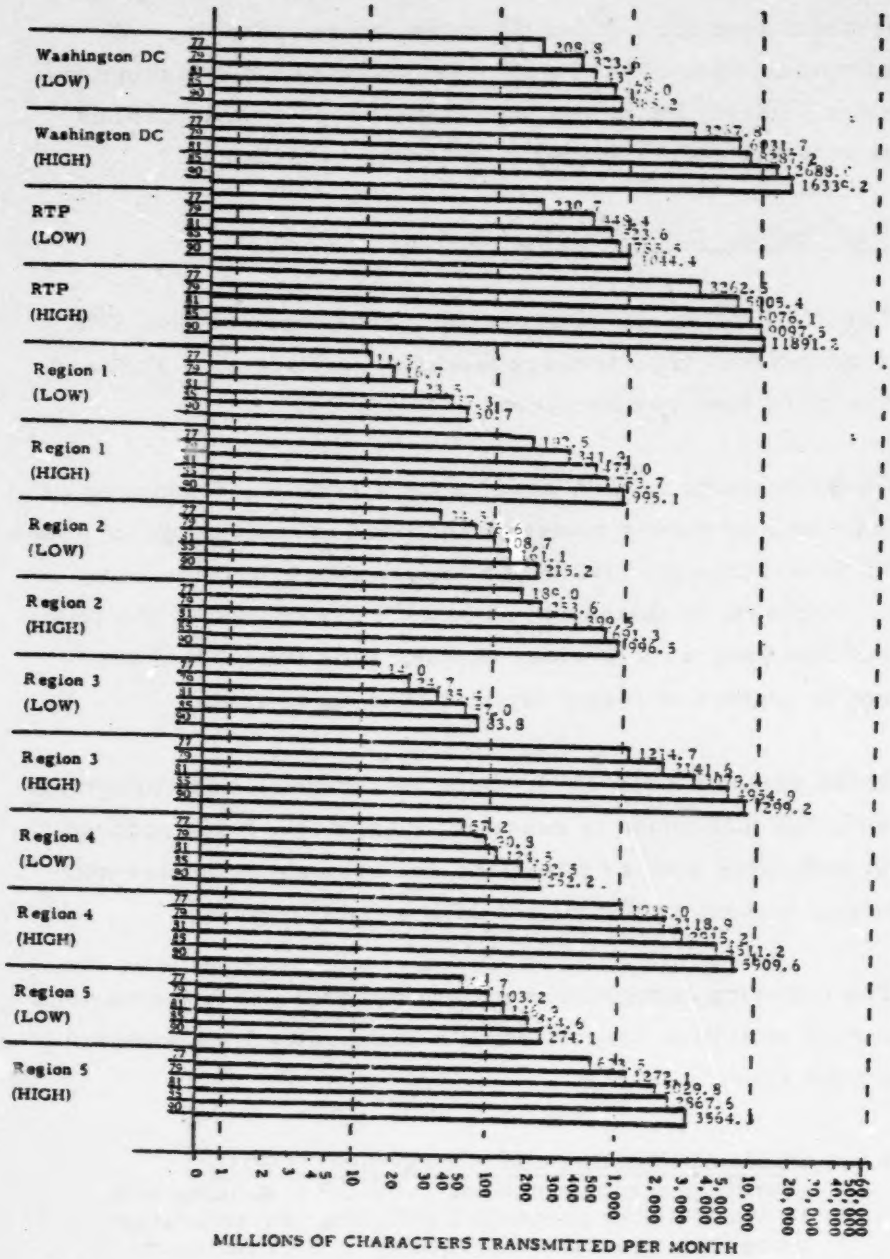


Figure 4-1. Total EPA Communications Workload Scenario 1

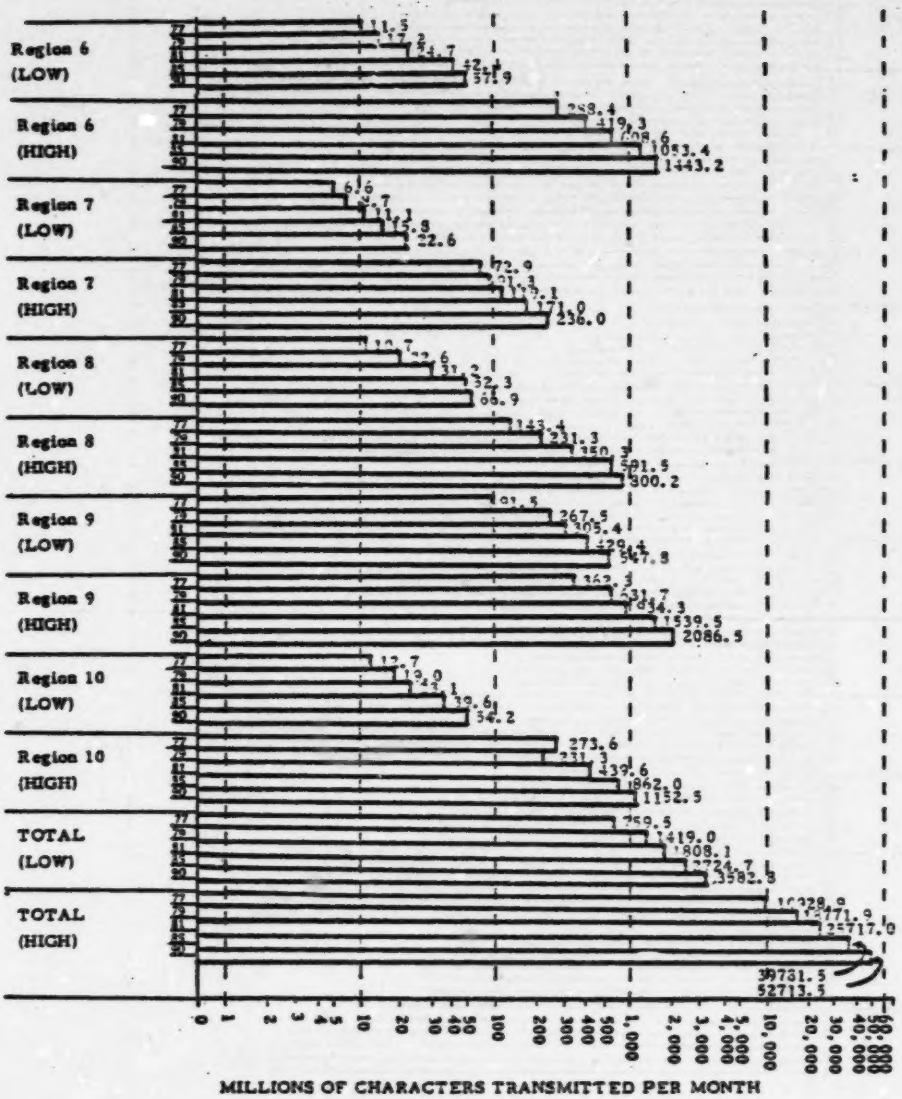


Figure 4-1. Total EPA Communications Workload (Continued)
Scenario 1

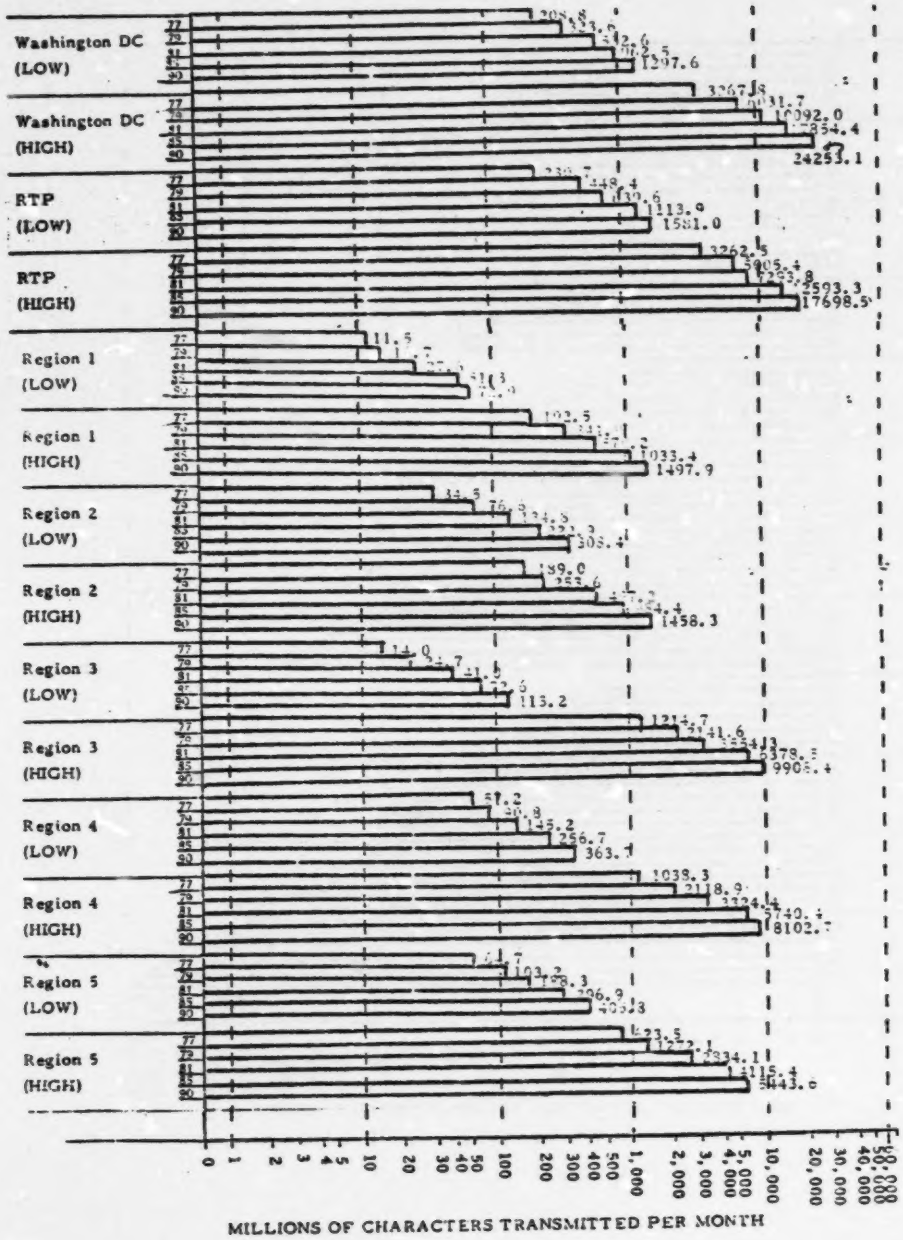


Figure 4-2. Total EPA Communications Workload Scenario 2

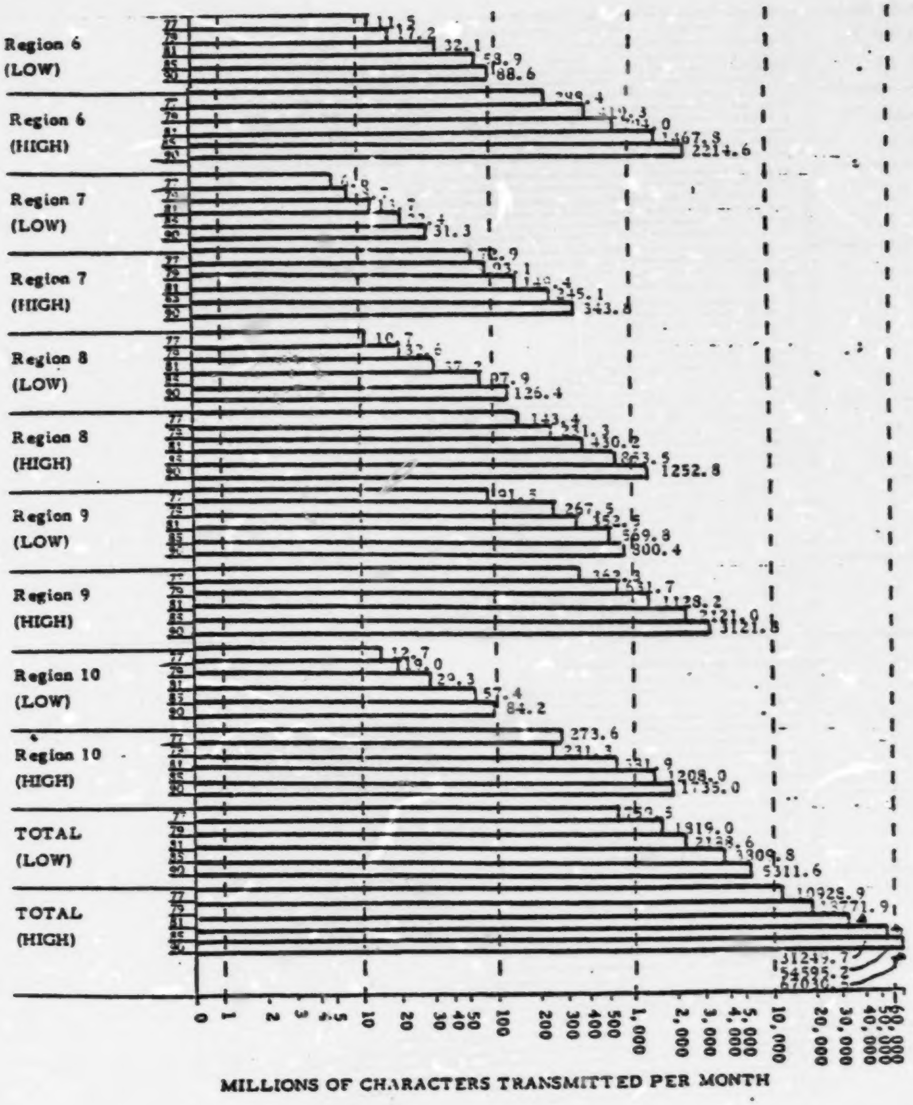


Figure 4-2. Total EPA Communications Workload (Continued)
Scenario 2

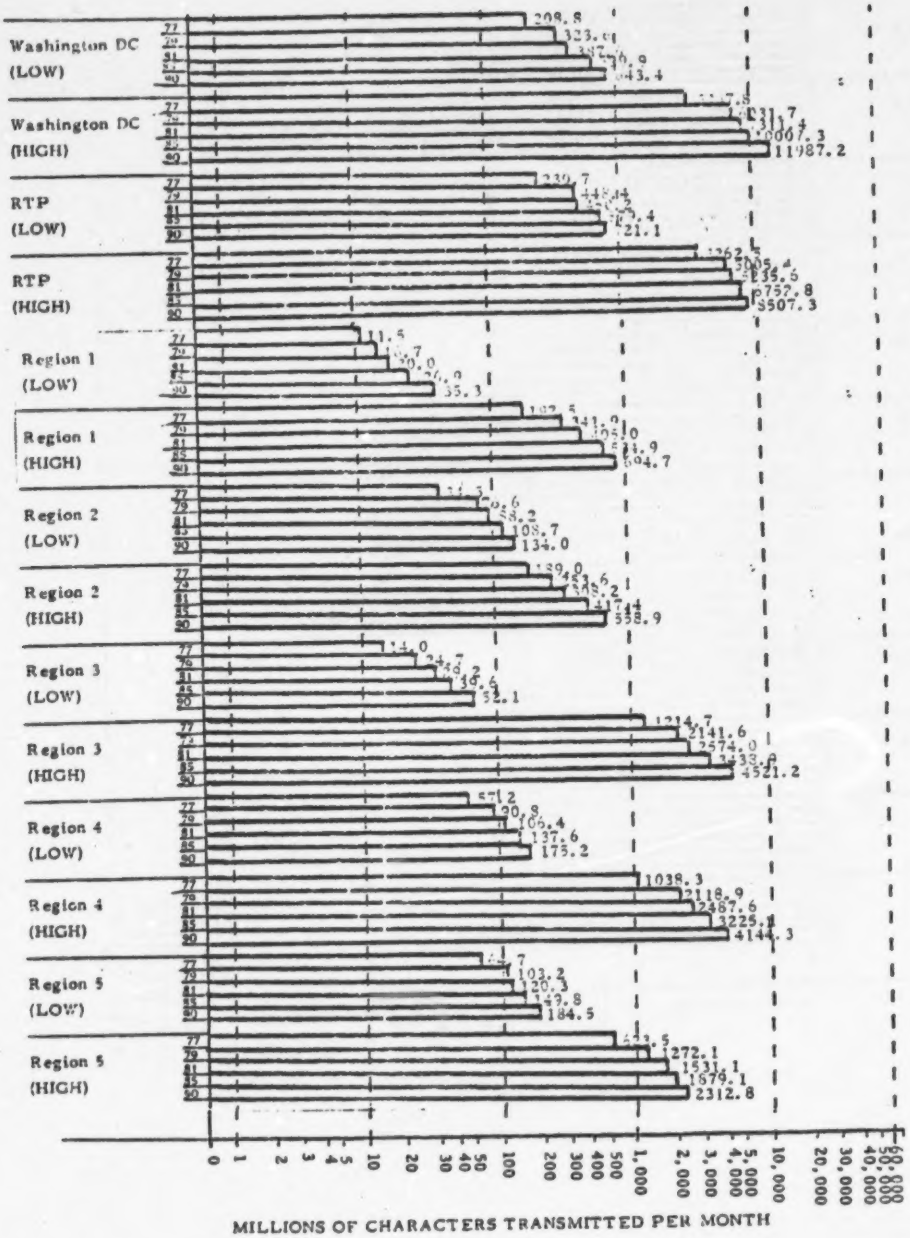


Figure 4-3. Total EPA Communications Workload Scenario 3

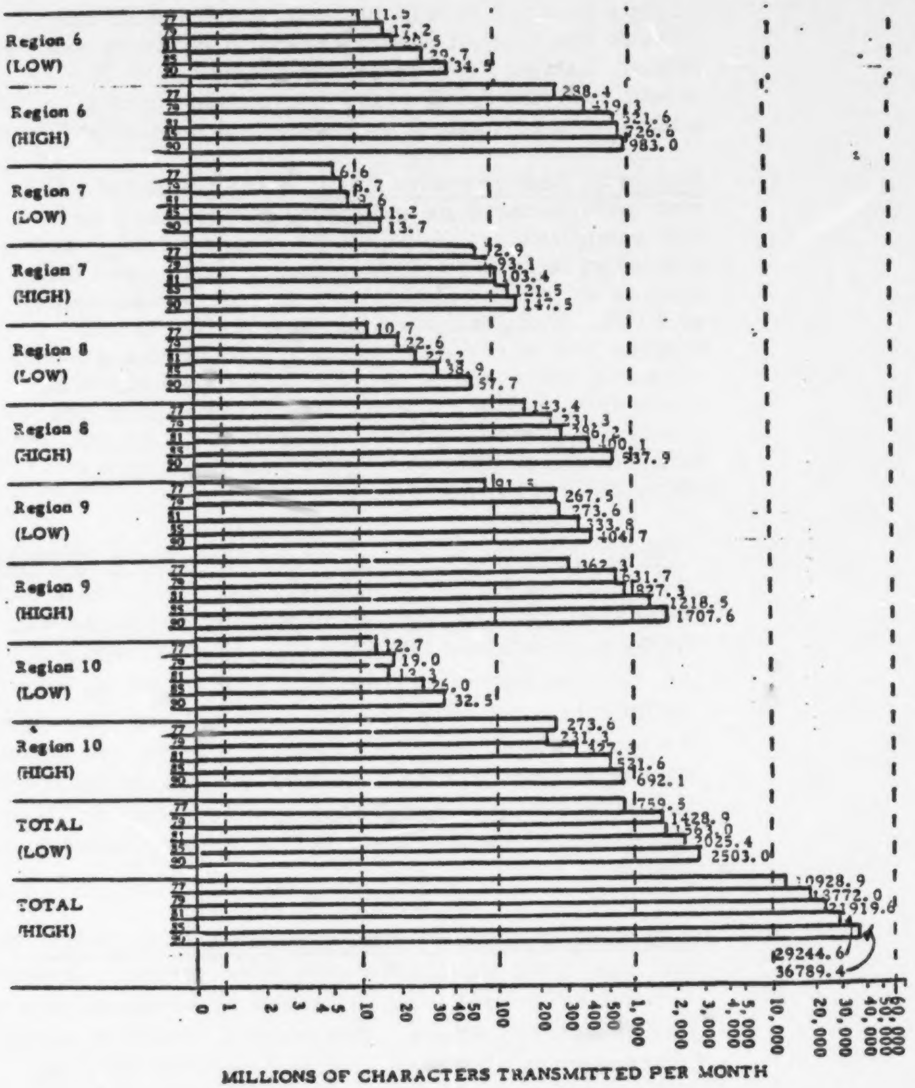


Figure 4-3. Total EPA Communications Workload (Continued)
Scenario 3

Higher activity levels in Scenario II would increase the rate of enhancement in existing systems. Lower activity levels in Scenario III would restrict ADP usage to minimal levels with a slower rate of system enhancement

- Office of Enforcement (OE): under Scenario I, new enforcement programs and increased permit complexity will cause OE usage of ADP and communications to grow slightly more than the agency in total, particularly in the period prior to 1979. Programs supporting toxics, solid waste, and water enforcement are strong growth areas in these early years. Under Scenario II, toxic enforcement operations would expand more. Scenario III would cause some reductions but ADP levels would not be affected as much as other budget areas

- Office of Water and Hazardous Materials (OWHM): new ADP activities in water supply and solid waste plus the impact of toxics in water programs will cause higher growth for OWHM in the near term under Scenario I. Overall growth rates, however, will be less than the agency in total over the projected period through 1990 as more water wuality program efforts are decentralized to states and regions. Scenario II would increase efforts in toxics-related programs, while Scenario III would reduce activities in grants and other local assistance projects

- Office of Air and Waste Management (OAWM): Noise and radiation programs may have stronger growth rates beyond 1979 under the influence of expected new legislation in these areas. Scenario II would cause general increases in all areas, while Scenario III would reduce efforts in many of the research and local assistance programs

- Office of Toxic Substances (OTS): ADP and associated communications workload under Scenario I is projected at a relatively high rate due to requirements of the Toxic Substances Control Act and continued growth in the pesticides program. Scenario II would cause a higher rate of new activity implementation and ADP workload. Scenario III would slow the rate of implementation but woule not eliminate any activities

- Office of Research and Development (ORD): ADP activity levels at EPA headquarters tend to increase at a slightly slower rate than associated activities at the ORD laboratories under Scenario I. Planning and management functions will expand to cover growth rates in research programs for solid waste, toxics, and energy. Scenario II would expand management programs in solid waste and toxics areas. Scenario III would reduce management programs to a minimal level

- Staff Offices: relatively few ADP activities are projected and overall growth is lower than headquarters averages. Some new ADP activities are planned for the Office of International Activities and existing programs in other areas will experience limited growth

Figures 4-4, 4-5, and 4-6 show the projected communications workload for each of the three scenarios for ADP activities at EPA headquarters. Projections for high and low speed volumes are presented for communications with WCC and NCC facilities.

4.4.3 Research Triangle Park (RTP) Geographic Area

The Research Triangle Park (RTP), North Carolina geographic area covers the Office of Air Quality Planning and Standards (OAQPS) operations in Durham and RTP, and the complex of four ORD laboratories at RTP. The four laboratories are the Environmental Sciences Research Laboratory (ESRL), Industrial Environmental Research Laboratory (IERL), Health Effects Research Laboratory (HERL) and Environmental Monitoring and Support Laboratory (EMSL).

The RTP geographic area shows a heavy initial increase in communications workload between 1977 and 1979 under Scenario I, then a more reduced rate of growth over the remainder of the period through 1990. ADP activities supporting air programs in OAQPS will rise in usage in the 1937 to 1979 period as more intensive use of

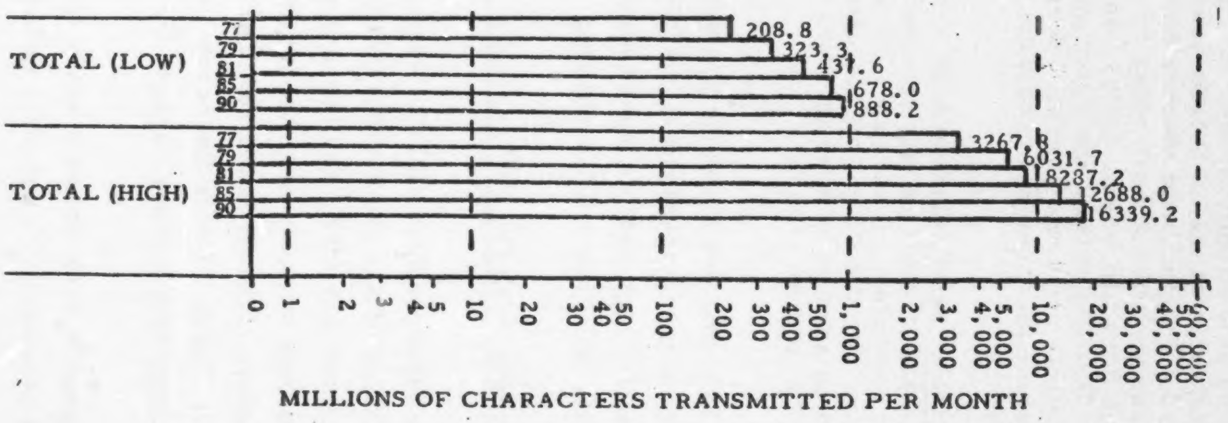


Figure 4-4. Washington, D.C. Geographical Area Communications Workload - Scenario 1

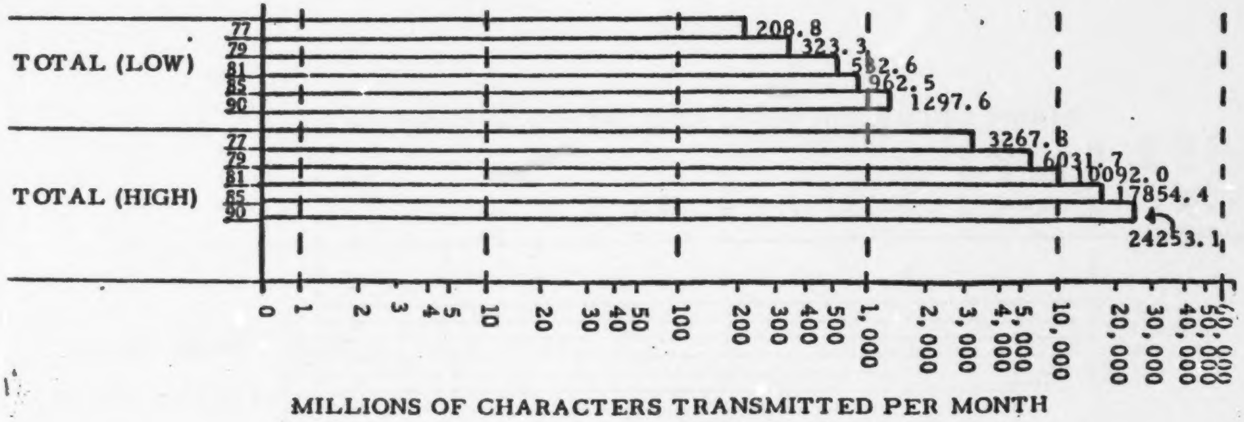


Figure 4-5. Washington, D.C. Geographical Area Communications Workload - Scenario 2

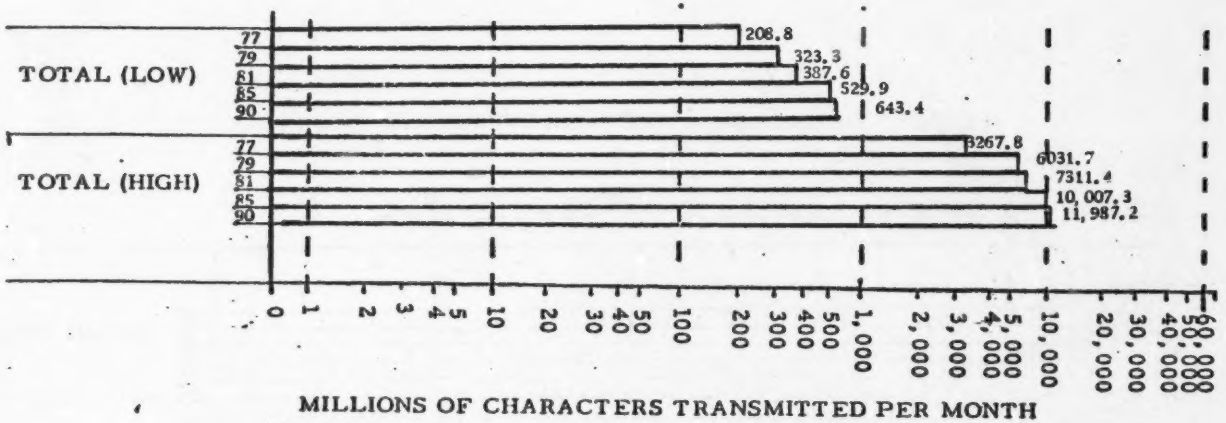


Figure 4-6. Washington, D.C. Geographical Area Communications Workload - Scenario 3

modeling for guidelines development and economic analysis is performed. Energy emissions programs will also grow more rapidly in this period. Beyond 1979, OAQPS use of ADP will grow less rapidly due to the decentralization of air data collection and preprocessing to states and regions, and a streamlining of air data management systems.

ESRL will decline in communications volume as ADP usage decreases with the end of the RAPS program in 1980. Under Scenario I, activity will start to increase after 1981 as the STATE System resumes air data collection programs. IERL has a heavier growth projection, particularly prior to 1979 due to the implementation of particle emission and management information systems in the near term period. An environmental assessment system (EADS) will become operational in 1979 and will continue long range growth in ADP activities for IERL.

HERL is one of the largest users of ADP and communications on the NCC facility and this trend is expected to continue under Scenario I. Growth prior to 1979 is projected at a higher rate than the balance of the period through 1990 with new studies in toxics related areas showing strong increases in ADP activity. EMSL will grow at a higher rate through 1981, then continue at a more reduced rate of growth as monitoring support and quality assurance functions are increasingly stressed, particularly in the early years of the projected period.

Under Scenario II, OAQPS would increase programs and activities in standards development and toxics monitoring. The RTP laboratories would obtain more contractual support and step up programs related to toxics and health risk areas.

Scenario III would restrict activities for OAQPS in air data base programs and the laboratories would reduce support in all but the highest priority programs (depending upon the stimulus) and would severely restrict contractual support.

Figures 4-7, 4-8 and 4-9 show the projected communications workload for each scenario between WCC/NCC facilities and user locations in OAQPS and the laboratories in the RTP area.

4.4.4 Region I Geographic Area

The Region I geographic area covers the Boston regional office, the Environmental Research Laboratory (ERL) at Narragansett, and the states of Maine, Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island.

Under Scenario I, the Region I area shows a moderate increase in workload until 1981 when a more gradual increase in communications growth begins. Prior to 1981 the Boston regional office and states will utilize STORET and other water quality and water supply systems with more intensity than in the past for data collection, analysis, and reporting in order to meet deadlines set by the Federal Water Pollution Control Act and the Safe Drinking Water Act. More of this workload, particularly in the data collection area, will be transferred from the regional office to the states as primacy for program management becomes more of a state responsibility. Research ADP systems at Narragansett will experience

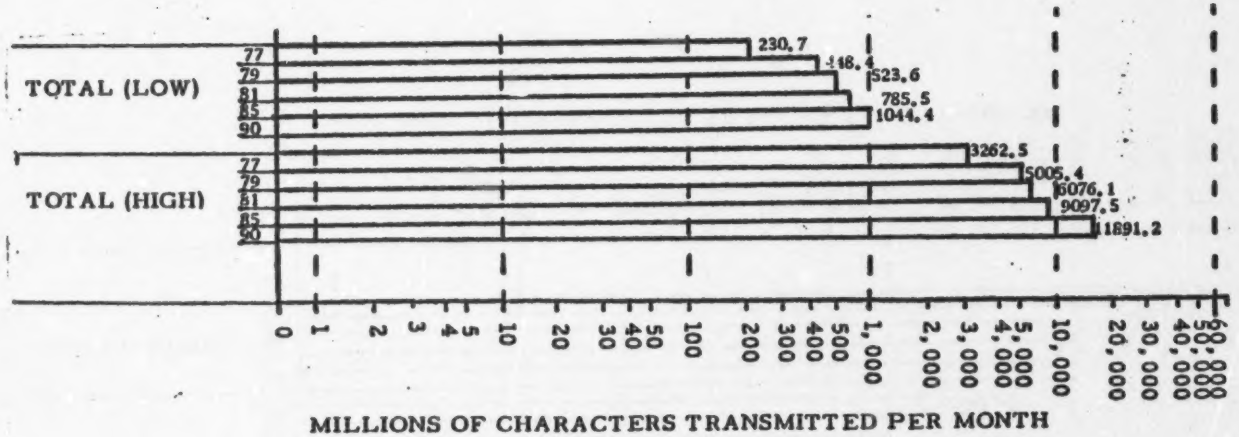


Figure 4-7. Research Triangle Park (RTP) Geographical Area Communications Workload - Scenario 1

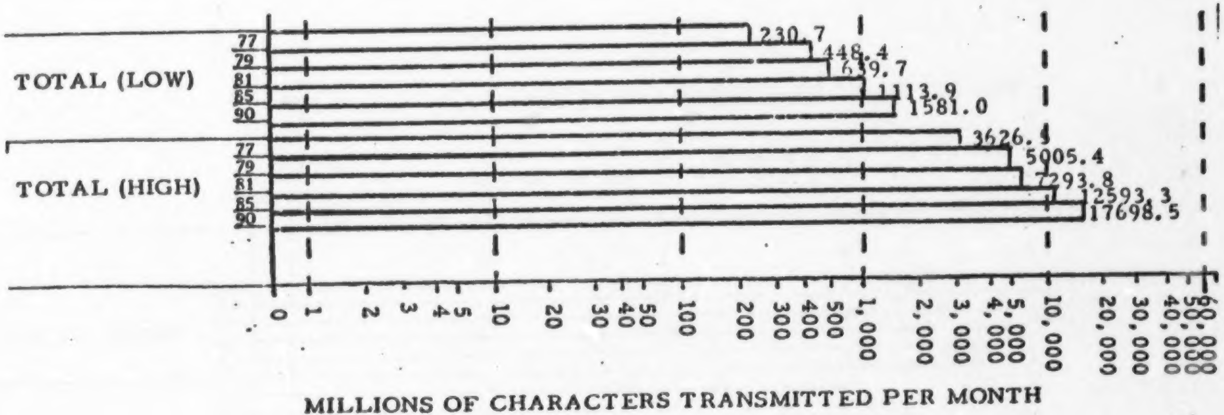


Figure 4-8. Research Triangle Park (RTP) Geographic Area Communications Workload - Scenario 2

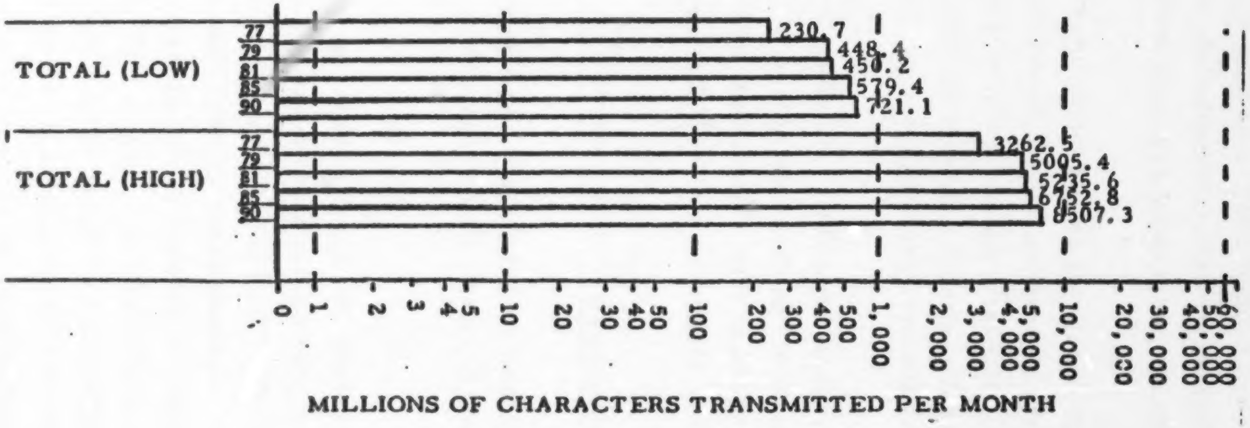


Figure 4-9. Research Triangle Park (RTP) Geographical Area Communications Workload - Scenario 3

only minor growth as local minicomputer systems handle more workload. The period of less rapid growth beyond 1981 is caused by the maturing of many systems now in developmental or implementation stages, and by the increasing use of distributed processing systems within the region.

Scenario II and higher activity levels would increase communications workload in programs supporting guideline setting, enforcement, data analysis and reporting. Scenario III and reduced activity levels would impact usage of internal regionally developed systems, with less impact in the use of national systems for water and air programs.

Figures 4-10, 4-11, 4-12 show the projected communications workload for each of the three scenarios in the Boston regional office, ERL-Narragansett lab, states, and other Region I users, for high and low speed traffic with WCC and NCC facilities.

4.4.5 Region II Geographic Area

The Region II geographic area covers the regional office in New York City, the states of New York and New Jersey, Puerto Rico and the Virgin Islands.

The Region II area under Scenario I shows an increasing communications workload through 1979 and a more gradual increase for the balance of the projected period through 1990. The rise in the early years is due to the Region II office use of their regional water enforcement system at WCC and the increased use of STORET by New York and New Jersey. New York expects to double their use of STORET starting in 1978 and Puerto Rico is also planning to use STORET at that time. The more reduced rate of growth beyond 1979 is due to the completion of new project implementations by the region and states, and by reduced rates of growth in data volumes.

Scenario II and higher activity levels would increase workload in most programs, especially water and water supply areas for standards

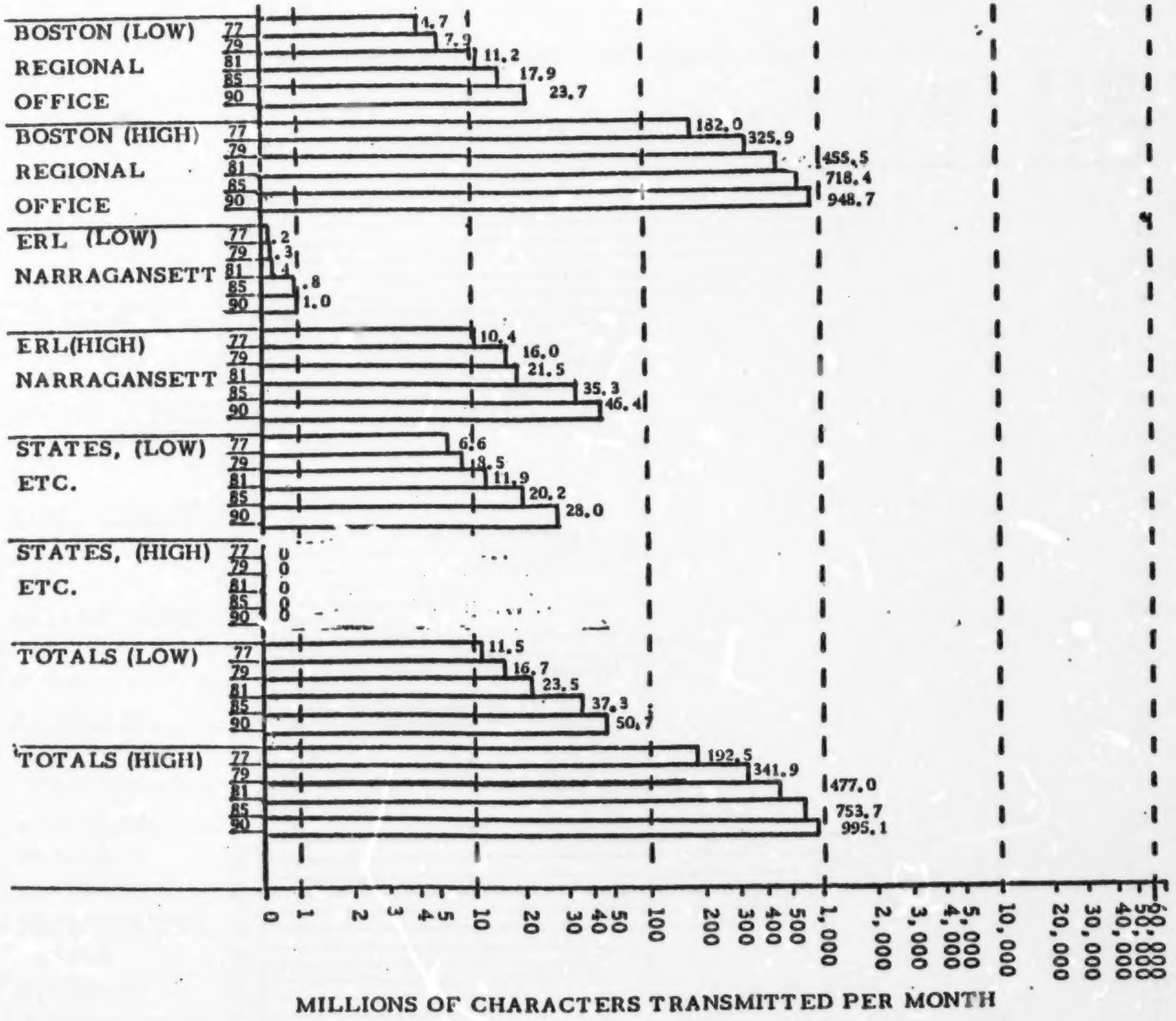


Figure 4-10. Region 1 Geographical Area Communications Workload - Scenario 1

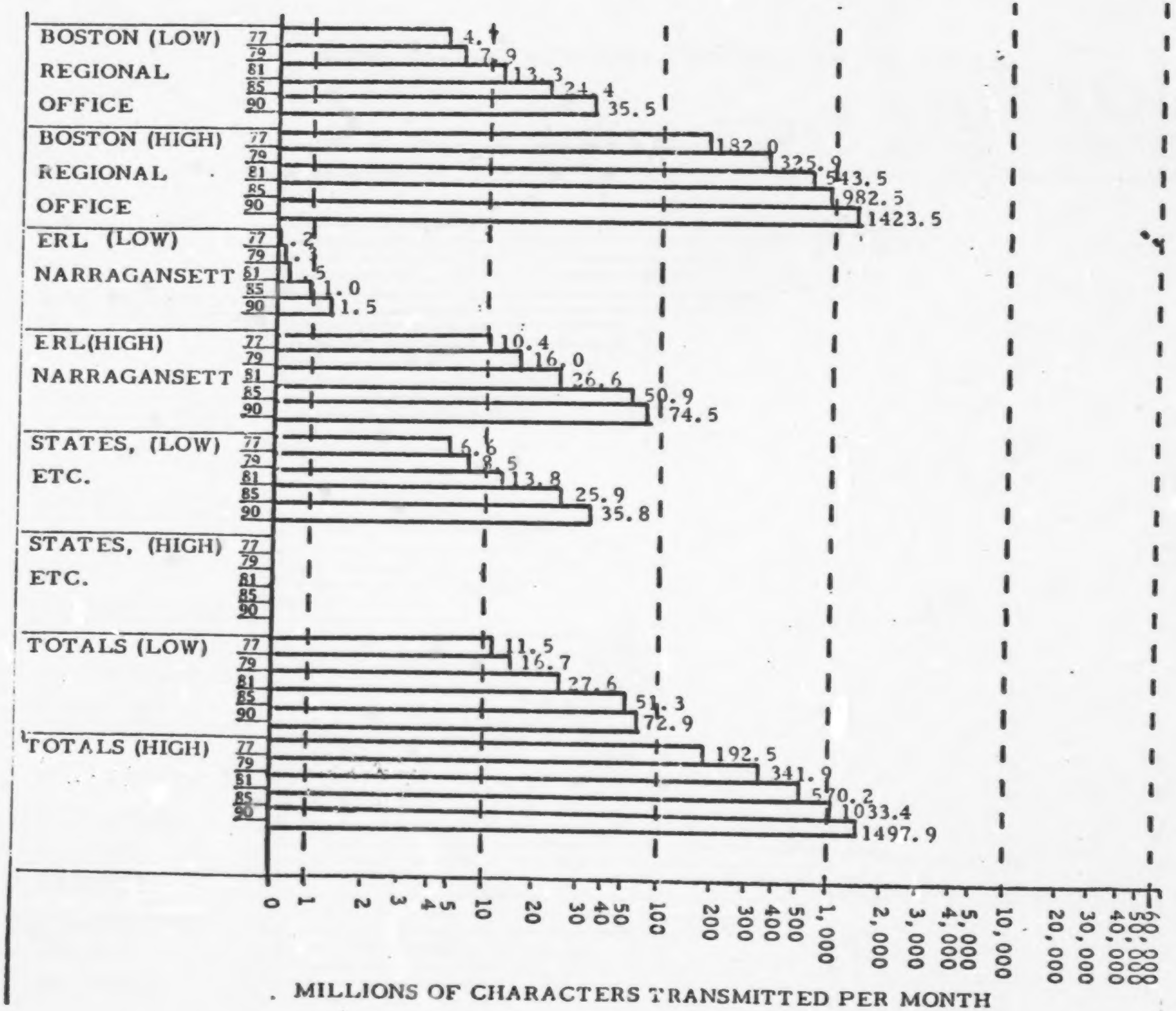


Figure 4-11. Region 1 Geographical Area Communications Workload - Scenario 2

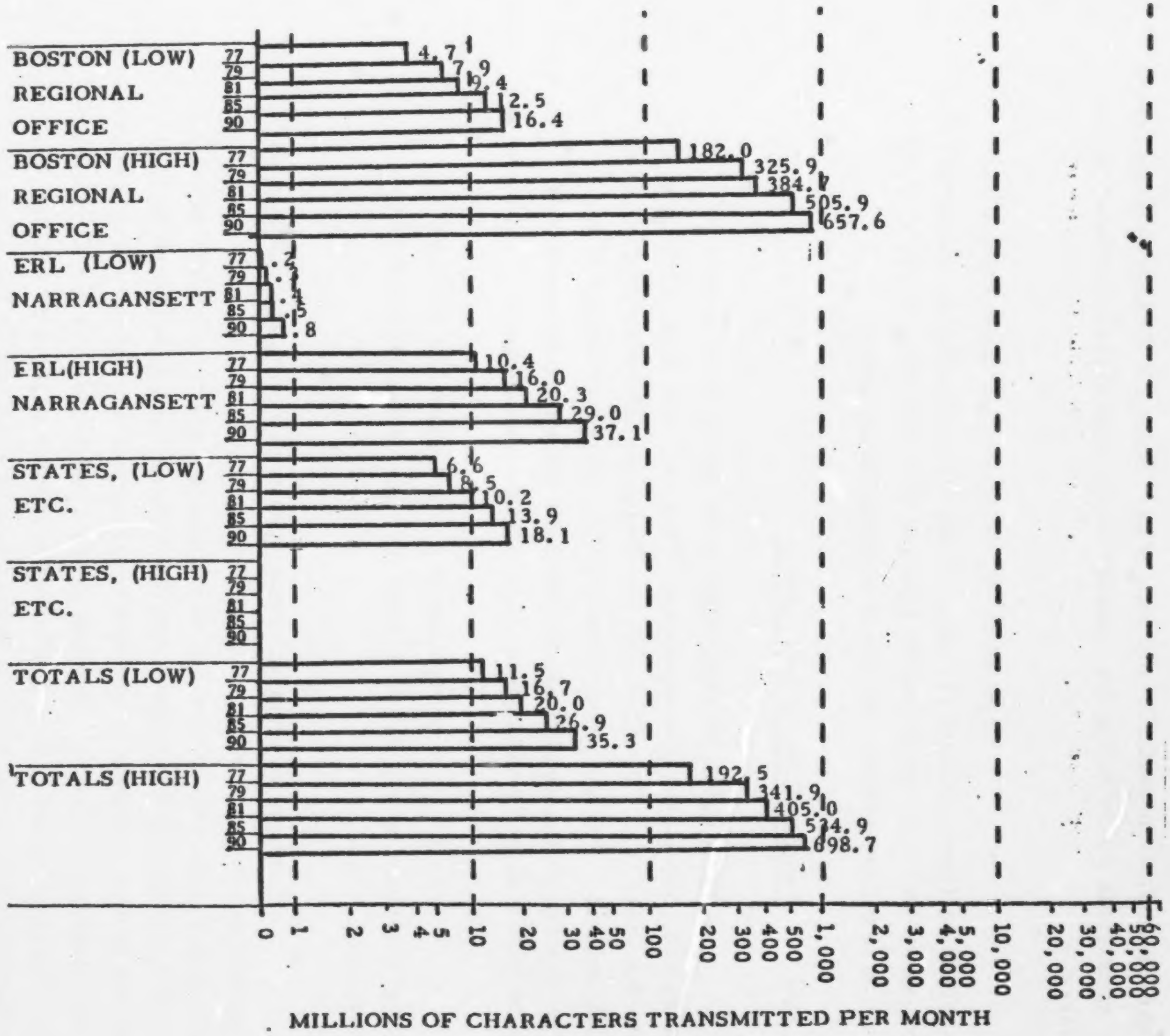


Figure 4-12. Region 1 Geographical Area Communications Workload - Scenario 3

development, data analysis and reporting. Scenario III and reduced levels of operations would force the transfer of more program workload to the states.

Figures 4-13, 4-14, 4-15 show the projected communications workload for each of the three alternative scenarios for low speed and high speed traffic between WCC/NCC facilities and the Region II office, states, and other regional area users.

4.4.6 Region III Geographic Area

The Region III geographic area includes the states of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, and the District of Columbia with the Regional Office located in Philadelphia. For purposes of this study, EPA operations in the Washington, D.C. metropolitan area have been treated separately in Section 4.4.2, "Washington, D.C. Geographic Area."

The future communications workload under Scenario I shows a moderate but steady growth throughout the projected future period to 1990.

Factors strongly affecting this growth rate are the Region's commitment to the implementation of data management and quality assurance programs, the integration of various programmatic data bases to provide overall environmental quality indices, and greatly intensified efforts in data analysis to support management decision-making and strategic planning. Also contributing to the growth rate are the Chesapeake Bay Program which involves all environmental aspects of the Bay and the implementation of the Federal Water Supply Program in the state of Pennsylvania. Further contributions to growth result from the increased usage of EPA systems by non-EPA users in analyzing and evaluating environmental data. The delegation of additional programs to the states is expected to increase state usage of STORET and other EPA systems.

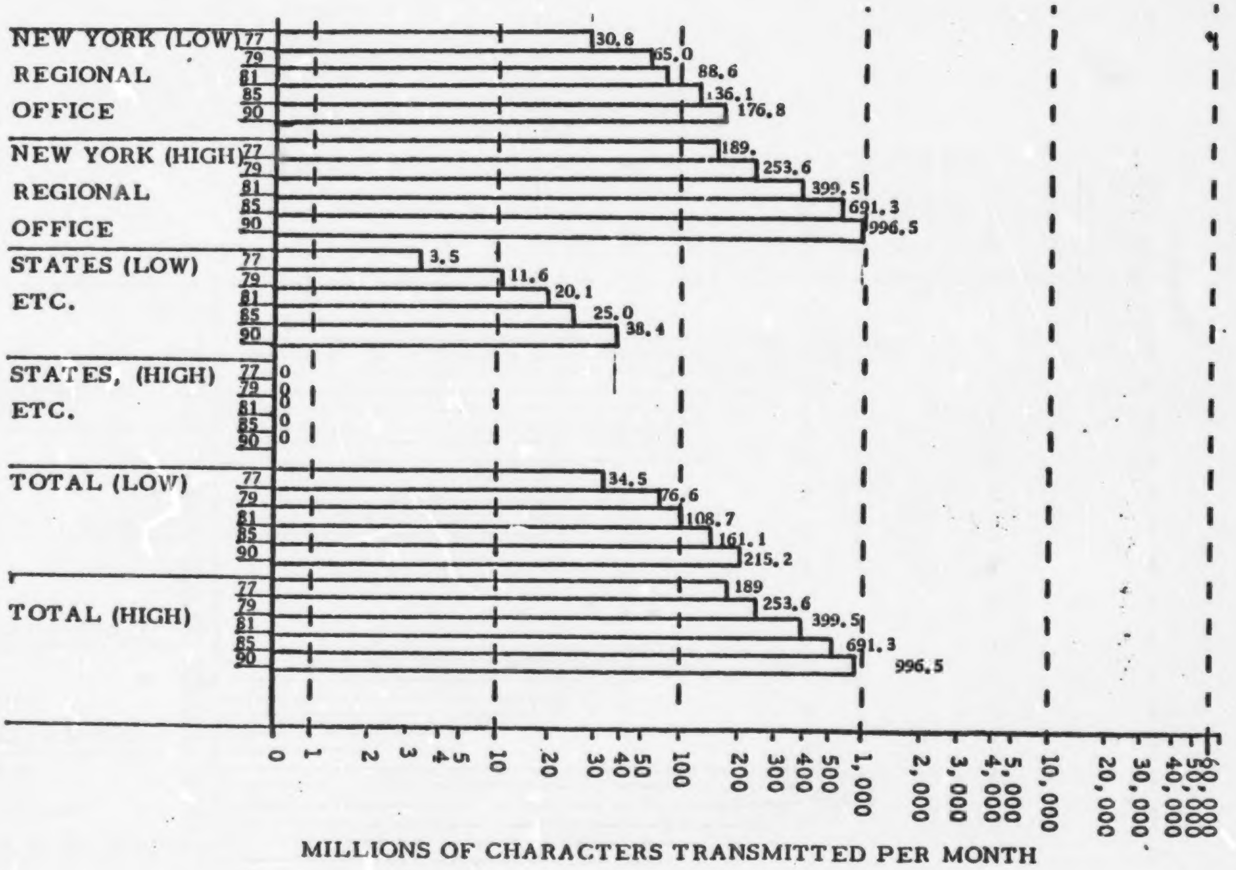


Figure 4-13. Region 2 Geographical Area Communications Workload - Scenario 1

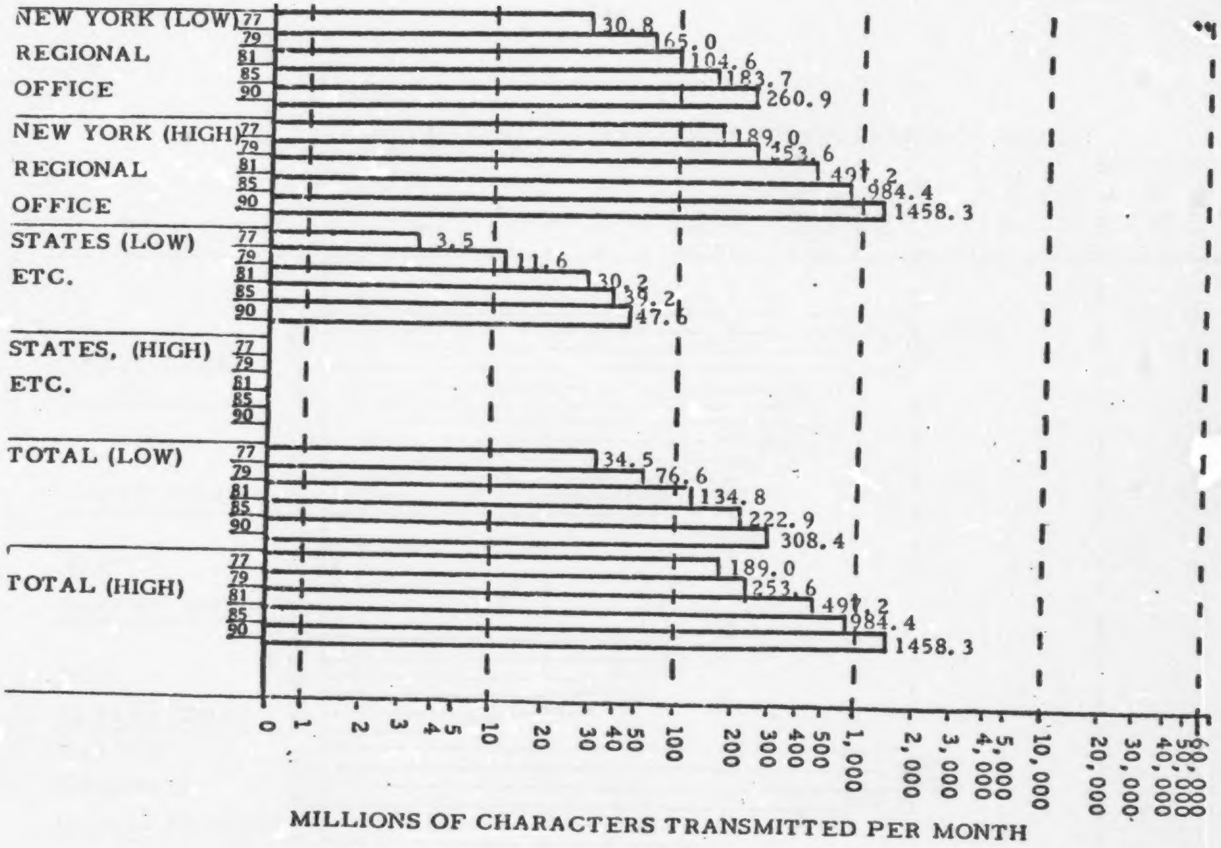


Figure 4-14. Region 2 Geographical Area Communications Workload - Scenario 2

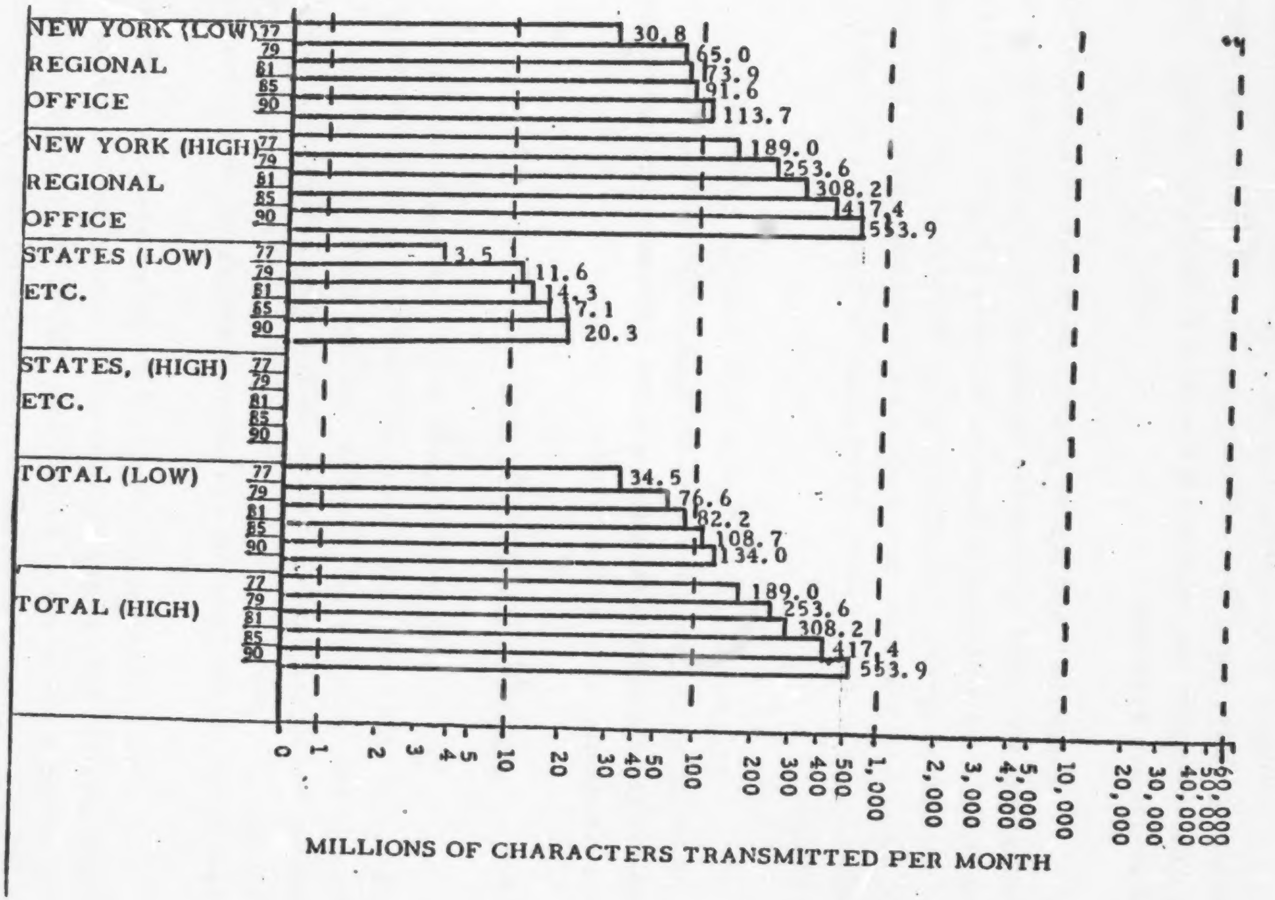


Figure 4-15. Region 2 Geographical Area Communications Workload - Scenario 3

Region III is considering the acquisition of a minicomputer which may offset some time-sharing growth in Regional ADP activities for data reduction and analysis for locally developed tracking, reporting, and evaluation systems.

Scenario II and higher activity levels would increase communications workload in all areas in support of regulatory requirements. Scenario III and selective reductions in activity levels would cause cutbacks in all programs, thereby reducing the communications workload, but, wherever possible, data analysis and evaluation activities would be shifted to the states, thereby increasing their share of the communications workload.

Figures 4-16, 4-17, and 4-18 show the projected communications workload for each scenario for high and low speed traffic volumes between the WCC/NCC facilities and the Regional Office and the non-EPA user locations.

4.4.7 Region IV Geographic Area

The Region IV geographic area covers the Atlanta regional office, the Environmental Research Laboratories (ERL) at Athens, Georgia and Gulf Breeze, Florida, and the states of Kentucky, Tennessee, North and South Carolina, Mississippi, Alabama, Georgia and Florida. For purposes of this study, EPA operations in Research Triangle Park, North Carolina are covered separately in Section 4.4.3.

The communications workload under Scenario I shows a relatively constant rate of growth over the projected period through 1990. The regional office use of STORET and SAROAD for water and air monitoring operations is expected to continue heavy usage throughout future periods. State use of STORET and other water systems is expected to grow over the same period. The regional office minicomputer system

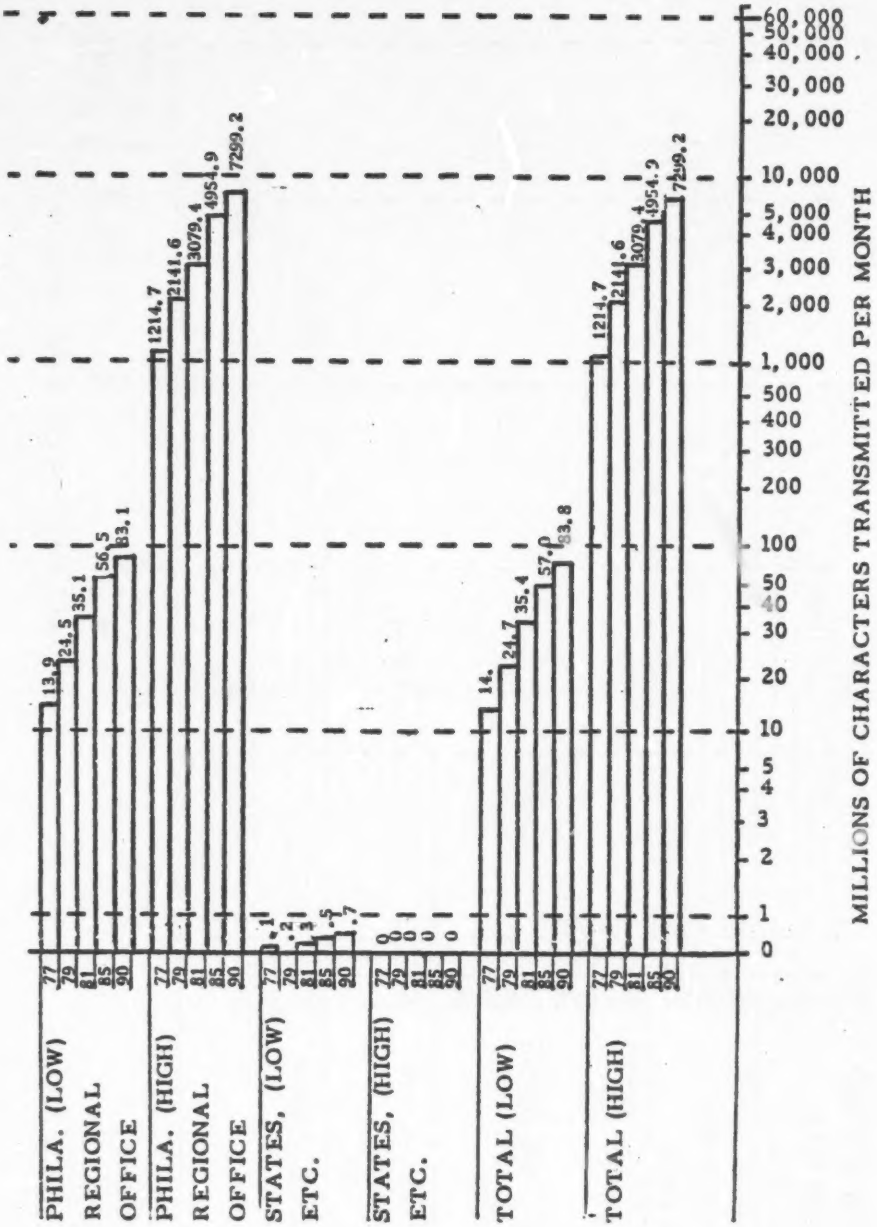


Figure 4-16. Region 3 Geographical Area Communications Workload - Scenario 1

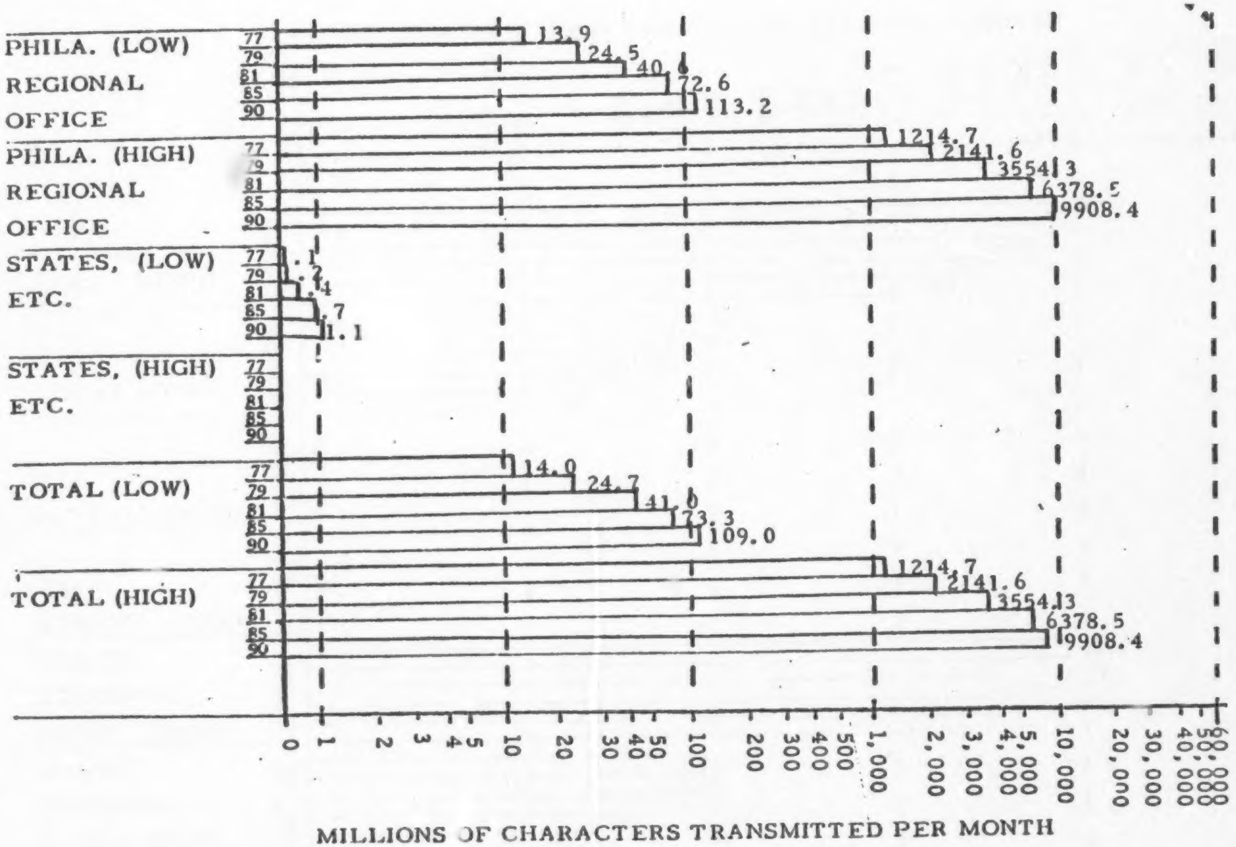


Figure 4-17. Region 3 Geographical Area Communications Workload - Scenario 2

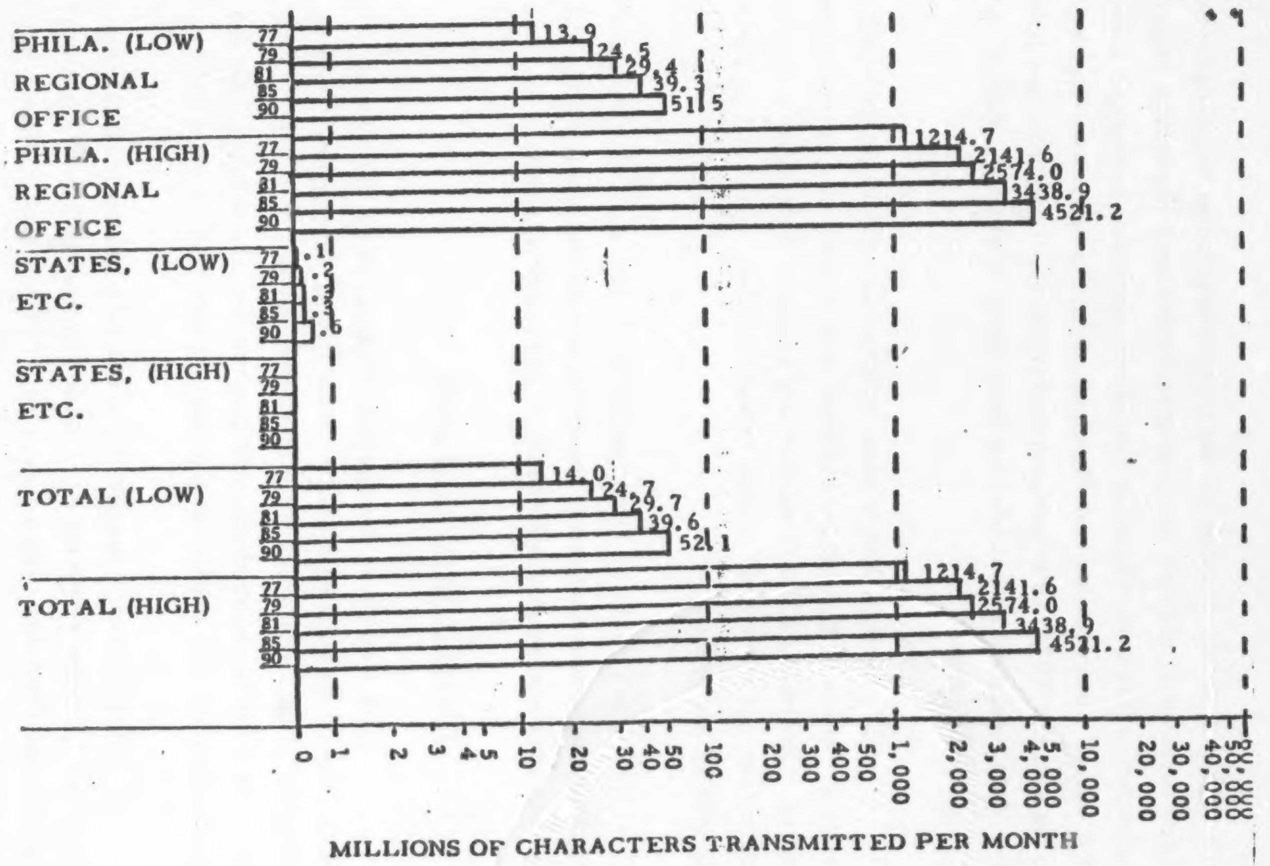


Figure 4-18. Region 3 Geographical Area Communications Workload - Scenario 3

will offset a small portion of the communications workload over the short term in activities for administrative and reporting requirements. Communications workload at the Environmental Research Laboratories in Athens, Georgia and Gulf Breeze, Florida will have higher growth curves in the 1979-1990 period, particularly at Athens for more intensive data analysis and modeling activities in energy, water, and toxics related programs.

Scenario II and higher activity levels would intensify programs at the laboratories, regional office, and states in water and toxics programs. Scenario III and selectively reduced activities would not delete any major activities but would transfer more workload to the states in air and water programs.

The charts in Figures 4-19, 4-20, 4-21 illustrate the projected communications workload for each scenario between WCC/NCC facilities and user locations in the Region IV geographic area.

4.4.8 Region V Geographic Area

The Region V geographic area covers the Chicago regional office, the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana, and Ohio, the complex of four laboratories at Cincinnati, Ohio, laboratories at Duluth, Minnesota and Grosse Ile, Michigan, and the Office of Mobile Source Air Pollution Control (OMSAPC) at Ann Arbor, Michigan.

A relatively steady increase in communications workload is projected for the regional area under Scenario I with continued growth in state and regional office usage of STORET and SAROAD for water and air quality monitoring and analysis. Toxics, pesticides, and solid waste systems are expected to grow in later years as the growth rate in air and water systems begins to level off. Local minicomputers at the regional office and laboratories will offset some of the growth in timesharing usage

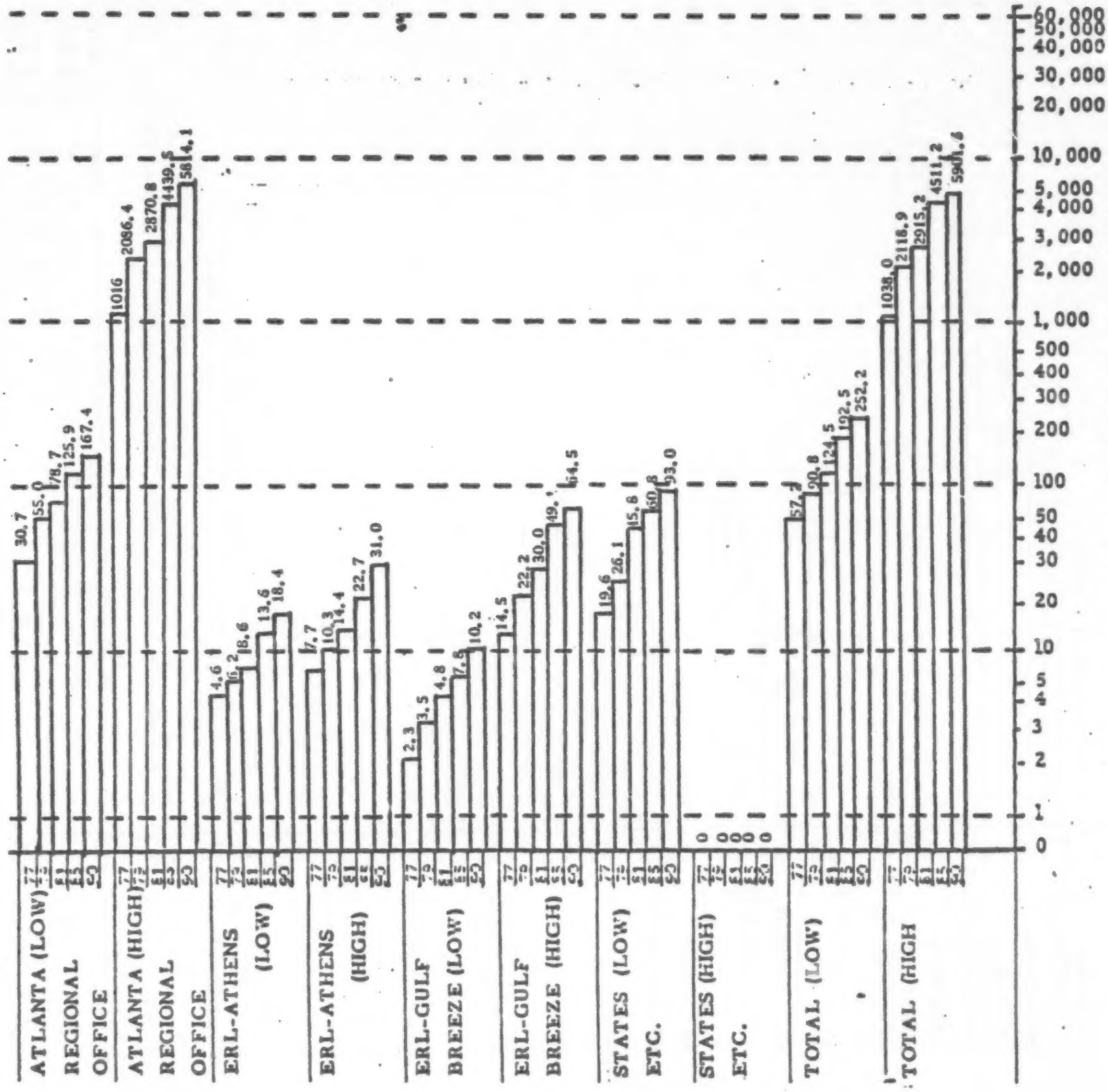


Figure 4-19. Region 4 Geographical Area Communications Workload - Scenario 1

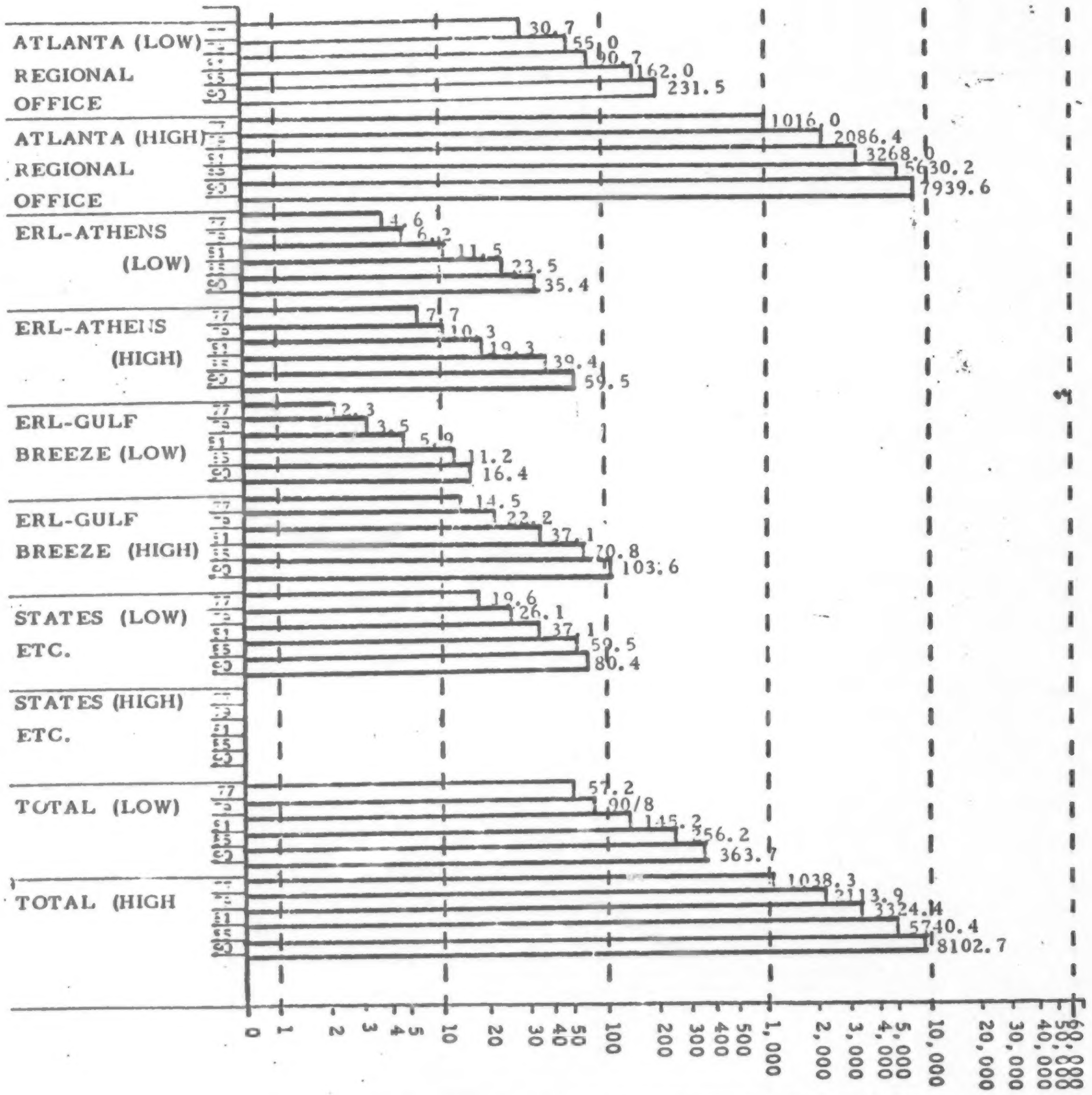


Figure 4-20. Region 4 Geographical Area Communications Workload - Scenario 2

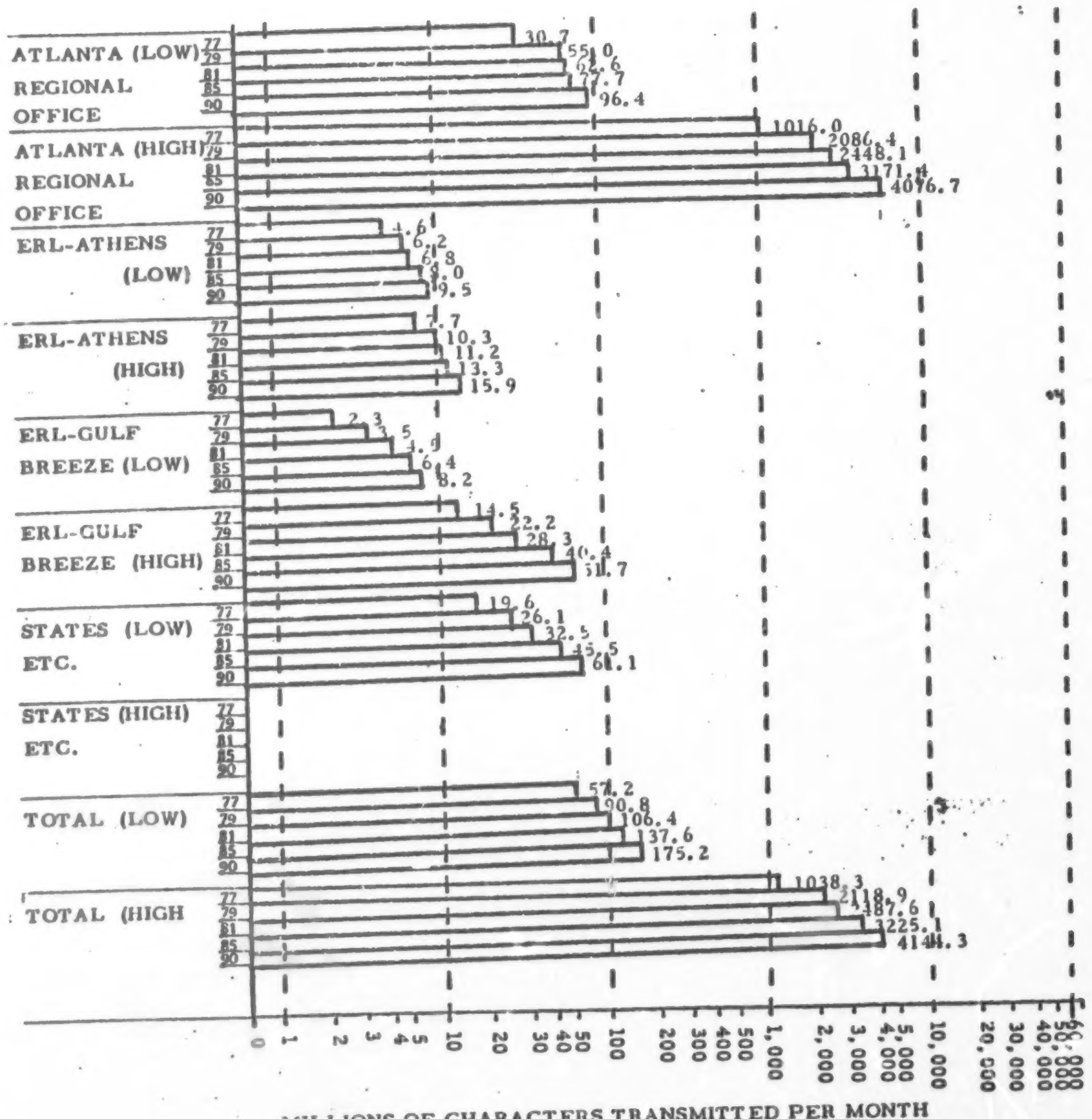


Figure 4-21. Region 4 Geographical Area Communications Workload - Scenario 3

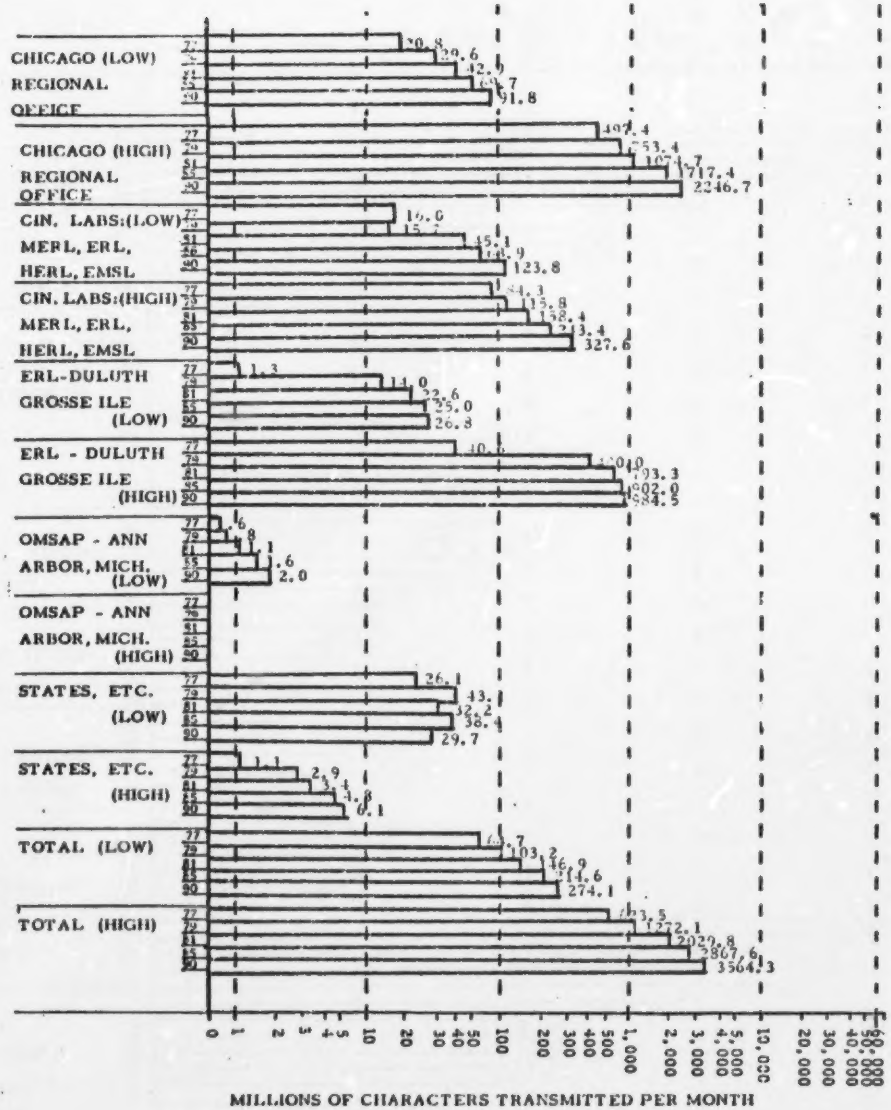


Figure 4-22. Region 5 Geographical Area Communications Workload - Scenario 1

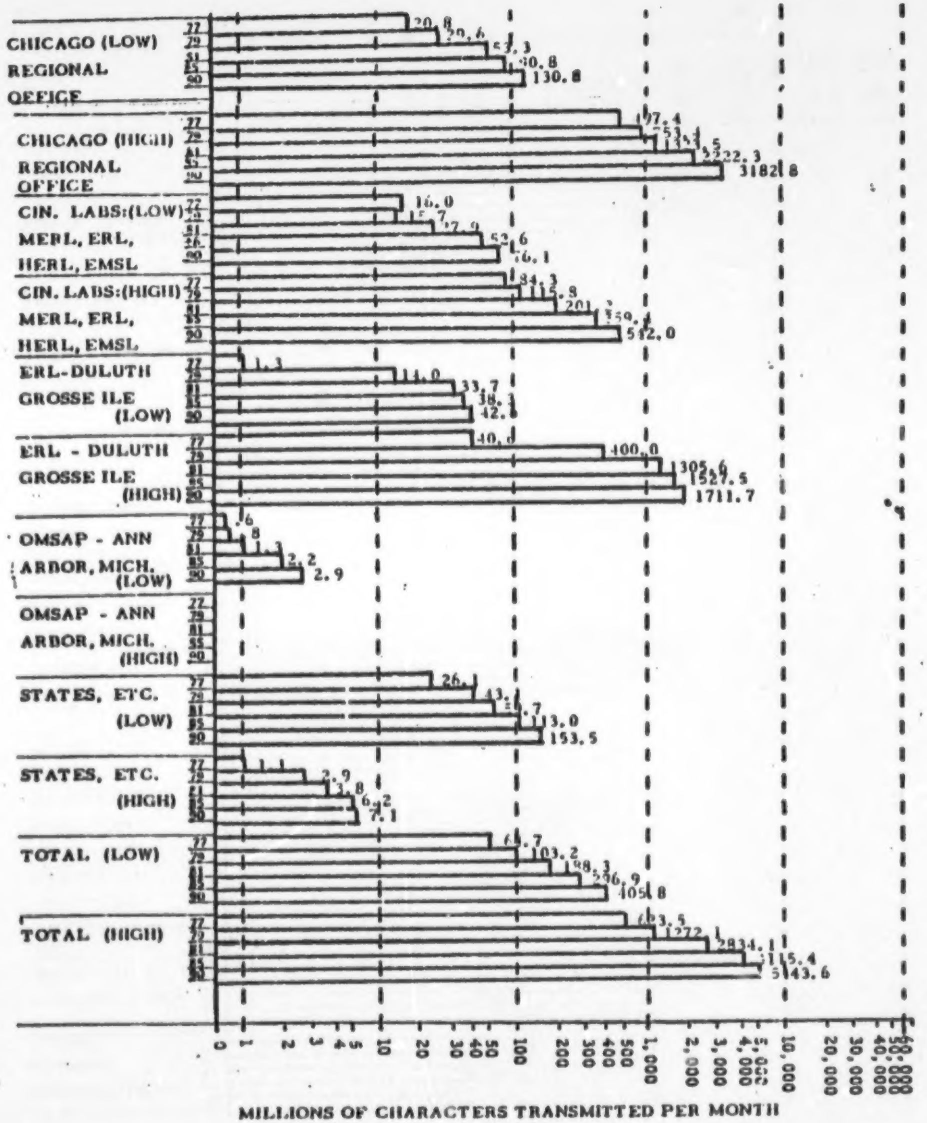


Figure 4-23. Region 5 Geographical Area Communications Workload - Scenario 2

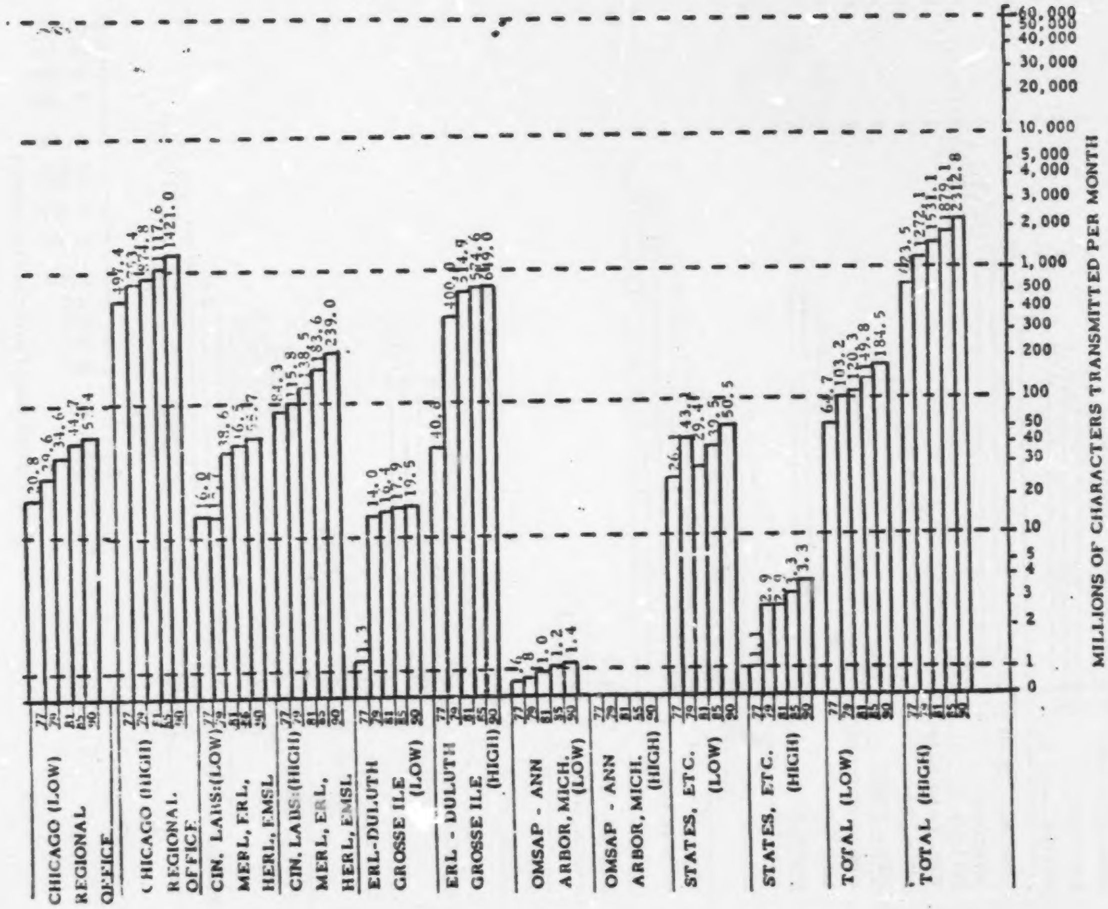


Figure 4-24. Region 5 Geographical Area Communications Workload - Scenario 3

as these systems are integrated more fully into program activities. Growth in communications at the laboratories will be relatively high in support of water supply, Great Lakes studies, energy, chemicals, sludge, and quality assurance development activities.

Scenario II and higher levels of activity would increase independent regional projects, state funding, and long term research projects with little impact on communications volume. Scenario III would selectively reduce workload in R & D activities at the labs and in the regional office.

Figures 4-22, 4-23, 4-24 show projected communications traffic for each scenario between user facilities and WCC/NCC computer operations.

4.4.9 Region VI Geographic Area

The Region VI geographic area encompasses the Dallas regional office, the states of New Mexico, Texas, Oklahoma, Arkansas, and Louisiana, and the Environmental Research Laboratory (ERL) at Ada, Oklahoma.

Communications workload in this regional area shows a gradual rate of increase under Scenario I throughout the 1977 to 1990 period. Increases in workload are caused primarily by state and regional office use of STORET and the Permit Compliance System in support of water quality analysis and reporting requirements of the Federal Water Pollution Control Act. The states will also continue use of the Grants Information and Control System for tracking progress of construction grant applications for water treatment facilities. All of these systems are processed on the WCC facility. The Environmental Research Laboratory at Ada will have minor impact on the regional area communications volume and will grow more slowly for analysis and modeling activities in

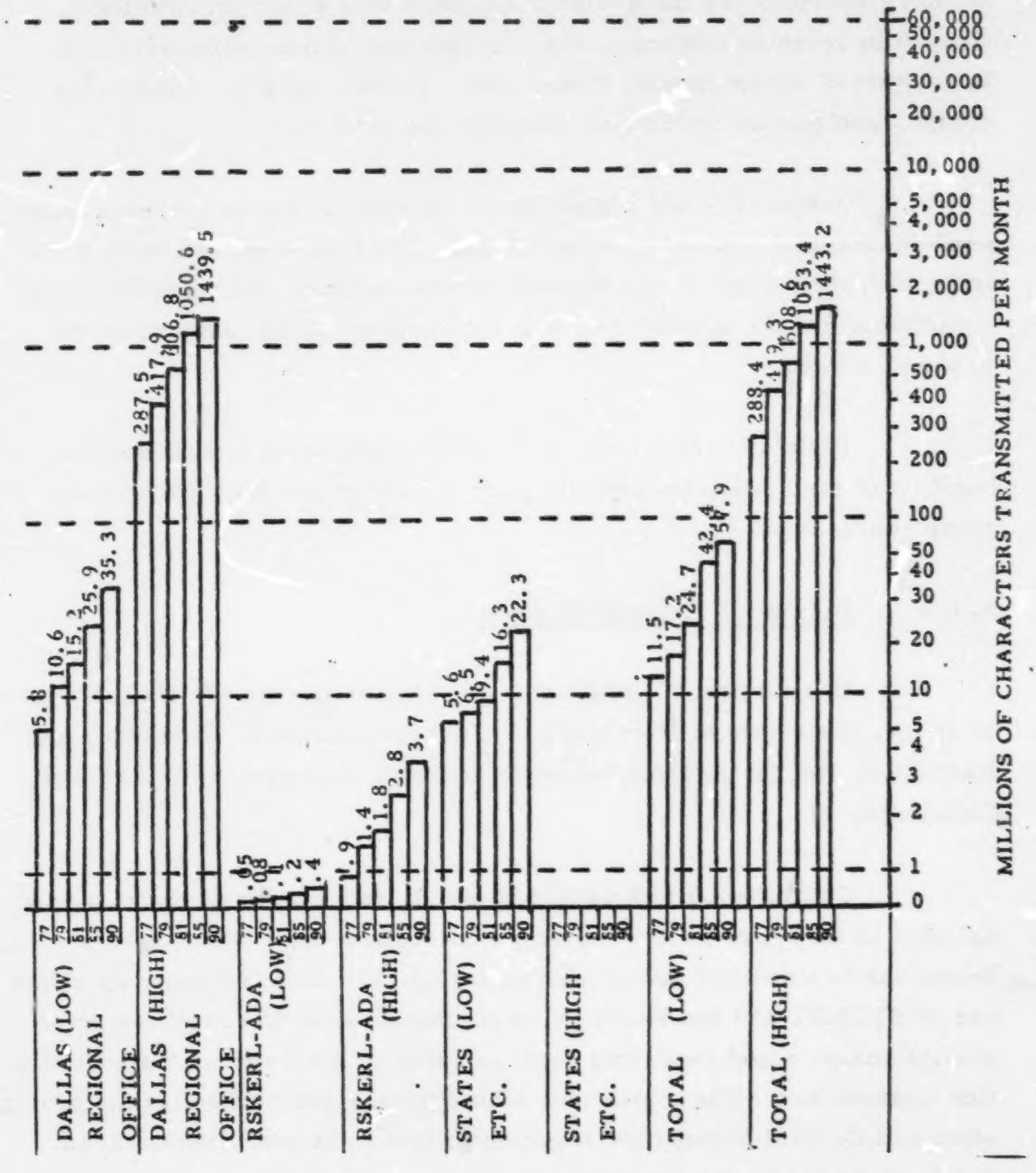


Figure 4-25. Region 6 Geographical Area Communications Workload - Scenario 1

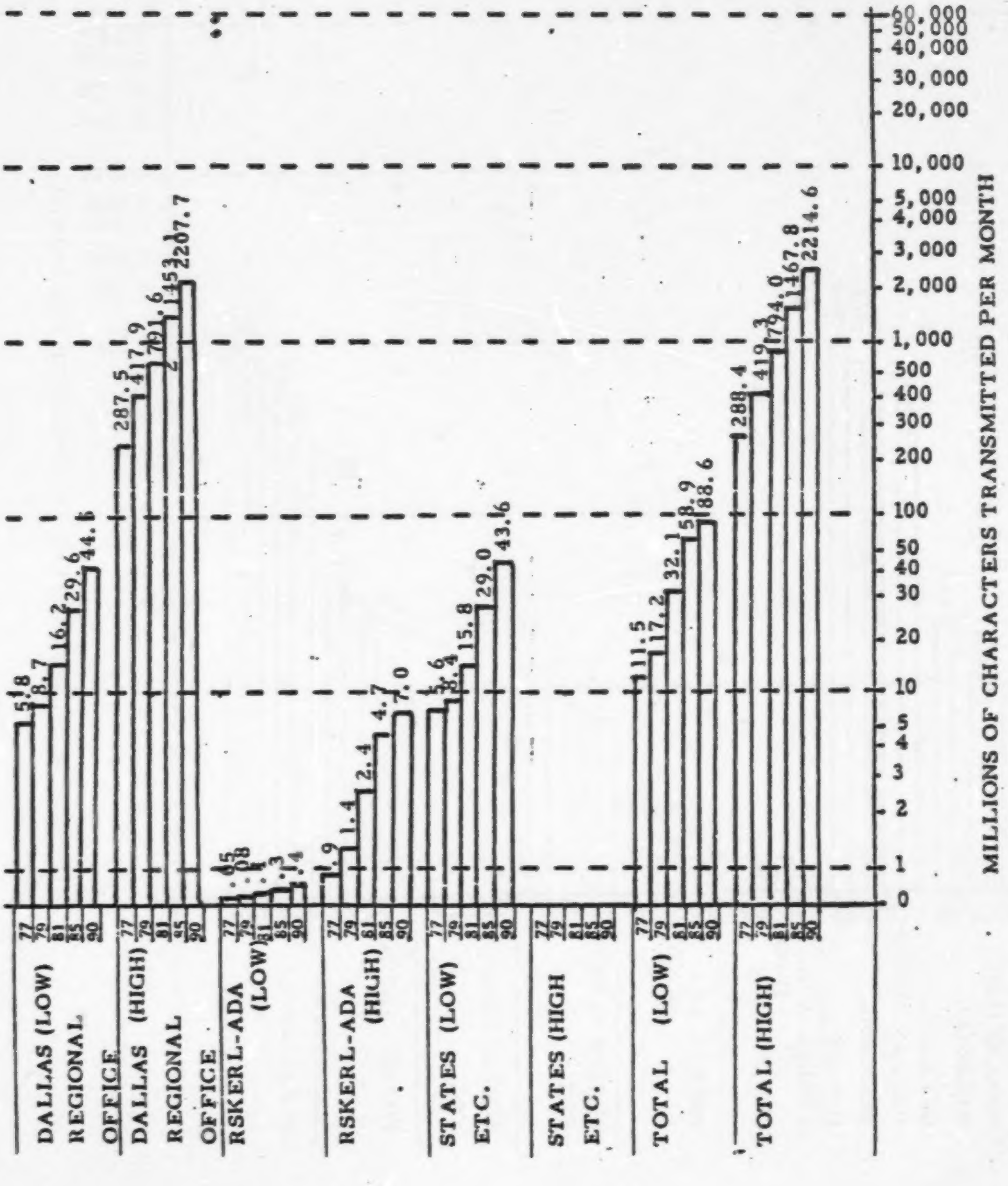


Figure 4-26. Region 6 Geographical Area Communications Workload - Scenario 2

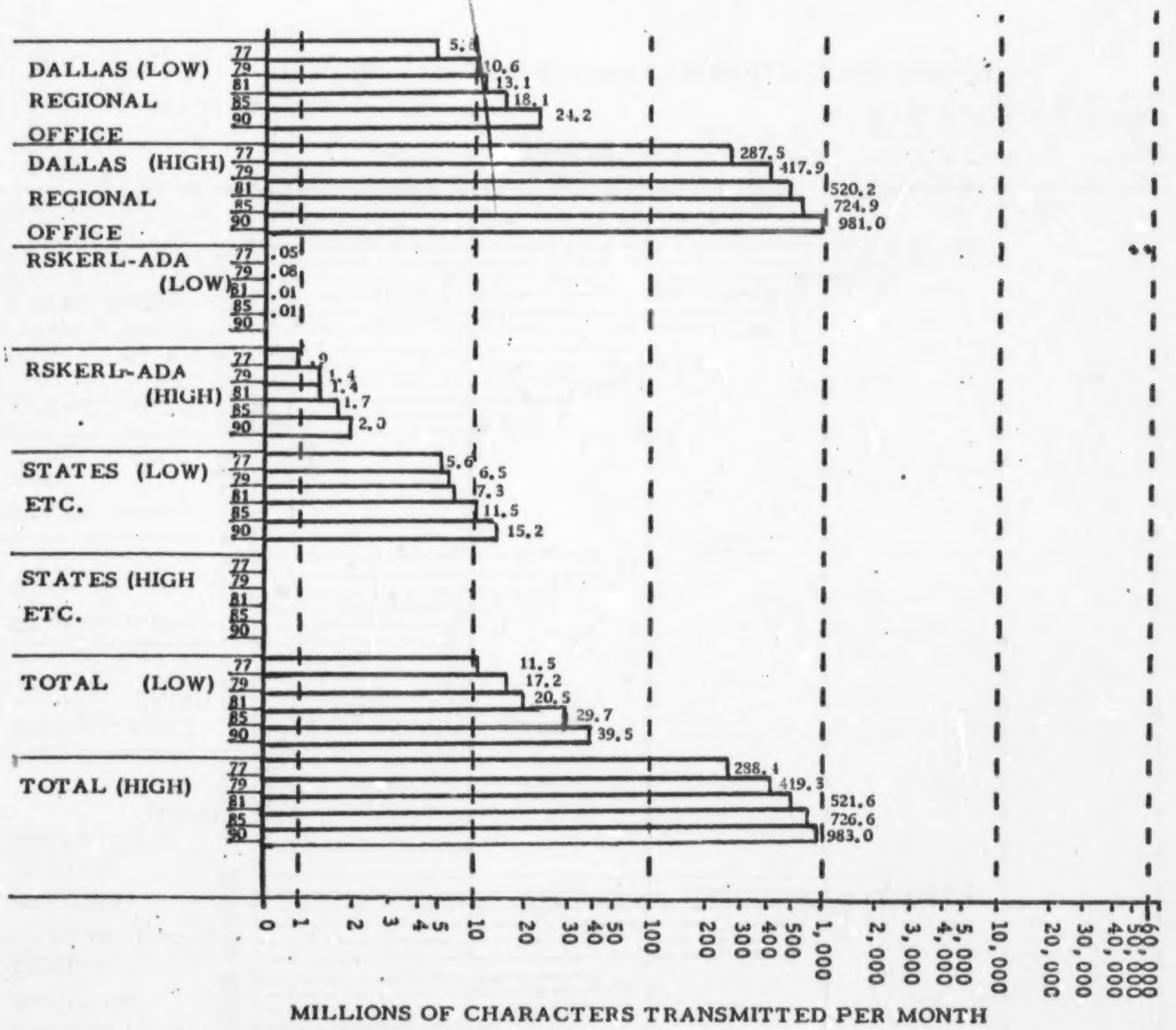


Figure 4-27. Region 6 Geographical Area Communications Workload - Scenario 3

water pollutant impact, wastewater treatment, and waste disposal studies.

Scenario II and higher levels of activity would increase communications volume in ADP functions supporting standards development, data analysis and reporting, and research projects in toxics and waste disposal.

Scenario III and selectively lower activity levels would not directly impact communications volume except for lower volume peripheral support projects in the regional office and the Ada Laboratory.

Figures 4-25, 4-26, 4-27 illustrate projected communications traffic for each scenario between state and EPA facilities to and from the WCC/NCC computing centers.

4.4.10 Region VII Geographic Area

The Region VII geographic area includes the regional office at Kansas City, Missouri, and the states of Nebraska, Kansas, Iowa and Missouri.

Scenario I projections of communications workload show an increase between 1977 and 1979, then a more reduced period of growth through 1990. The initial increase is caused by increased automation of procedures in the regional office coupled with new programs in toxic substances and solid waste. Beyond 1979, a regional office minicomputer is expected to handle an increasing share of the ADP workload while state use of systems such as STORET will increase only marginally.

Scenario II and generally increased levels of activity would not materially impact regional area ADP communications workload. Scenario III and selective reductions in activity levels would reduce communications workload in all but mandated reporting requirements for air, water, and toxics programs.

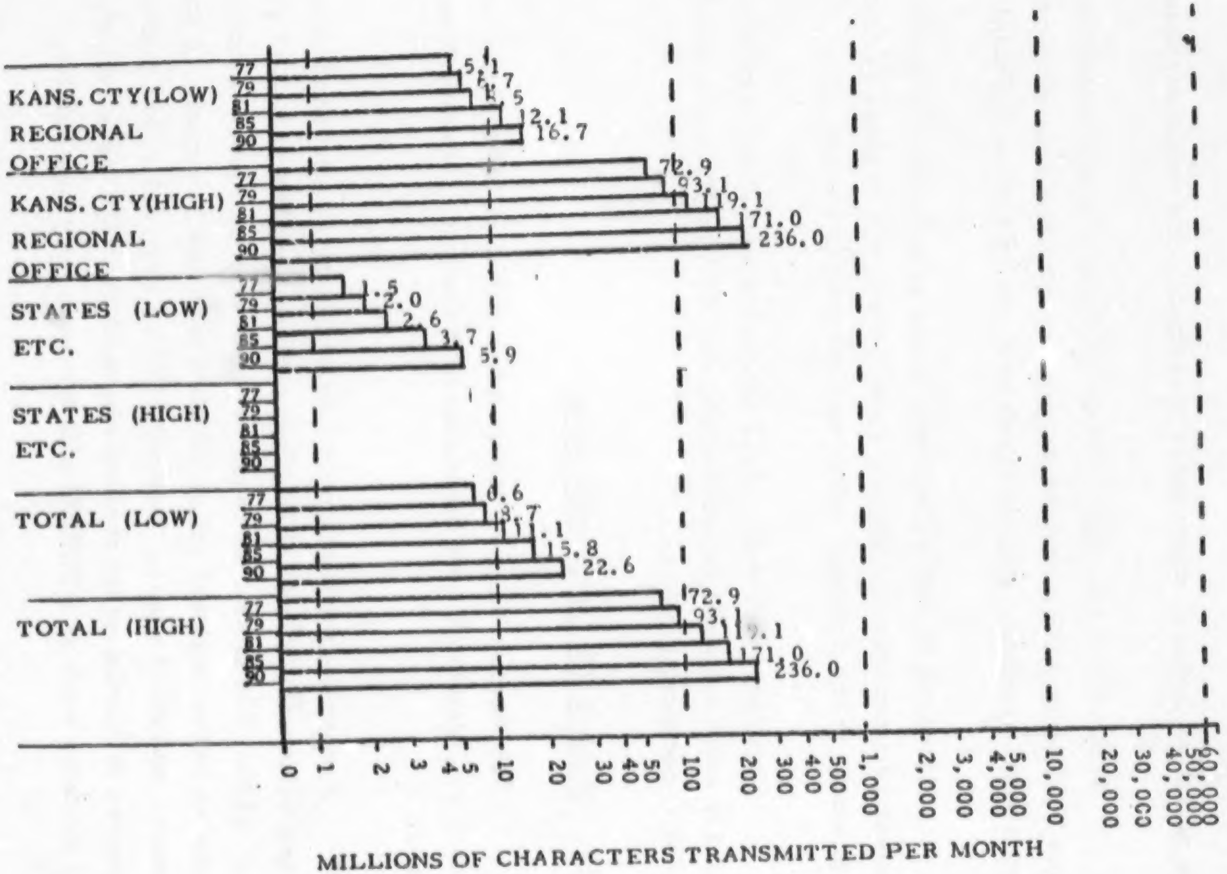


Figure 4-28. Region 7 Geographical Area Communications Workload - Scenario 1

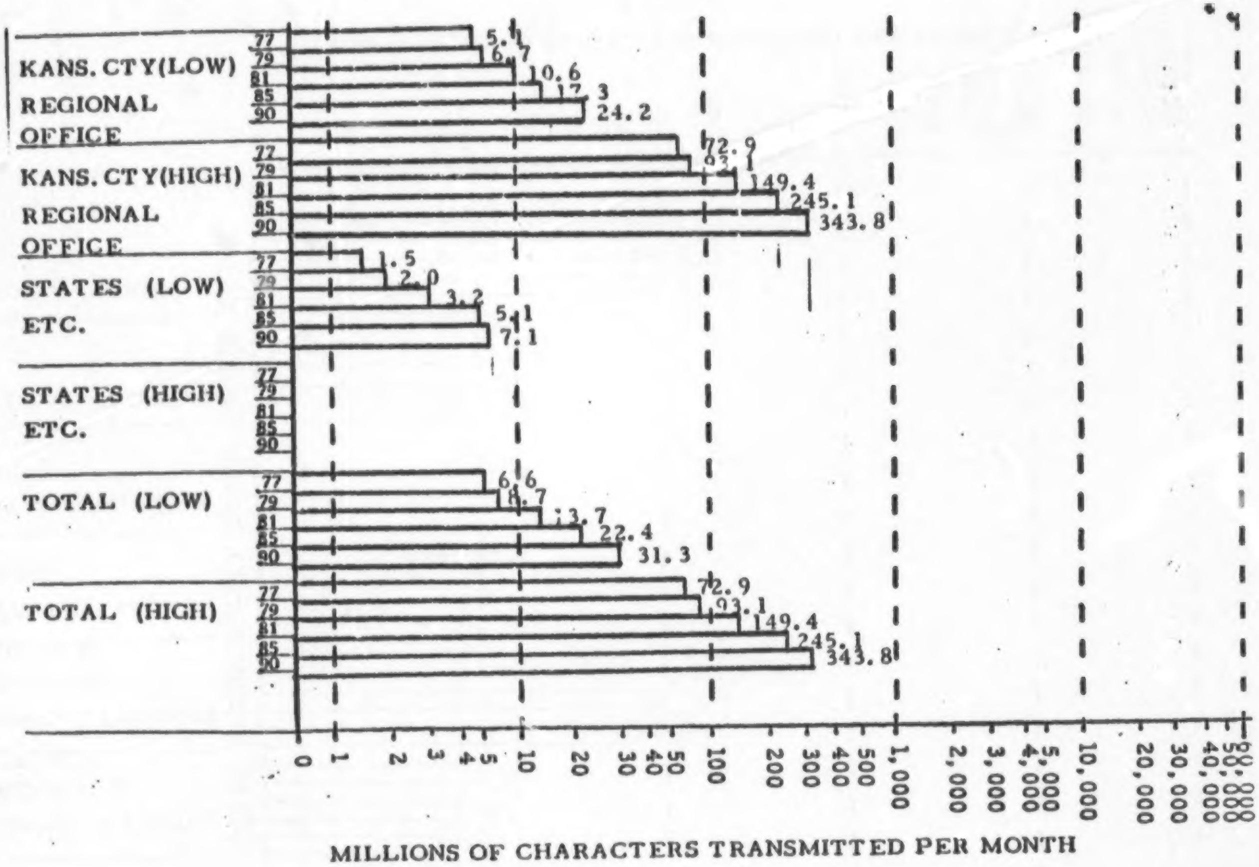


Figure 4-29. Region 7 Geographical Area Communications Workload - Scenario 2

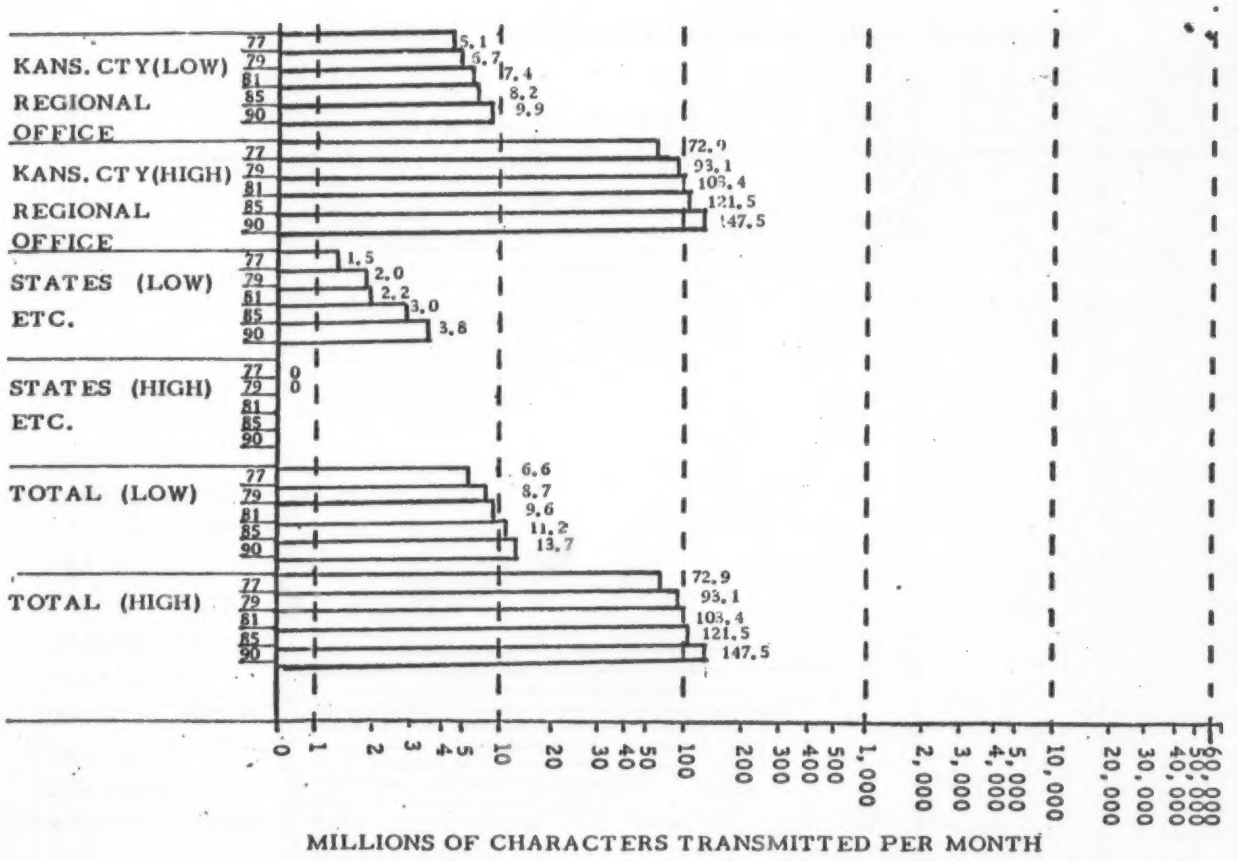


Figure 4-30. Region 7 Geographical Area Communications Workload - Scenario 3

Figures 4-28, 4-29, 4-30 show projected communications volume for each scenario in data transmission volumes for state and regional office users of WCC/NCC facilities.

4.4.11 Region VIII Geographic Area

The Region VIII geographic area encompasses the Denver, Colorado regional office, the states of Montana, Wyoming, North and South Dakota, Utah, and Colorado, and the National Enforcement Investigation Center in Denver.

Communications workload growth under Scenario I increases moderately throughout the period from 1977 to 1990. States in the region will continue their use of STORET for water quality monitoring and reporting at a slightly increasing rate. The regional office and the enforcement center will continue their use of STORET (WCC) and SAROAD (NCC) for water and air quality tracking functions with marginally increasing volumes over the years as more enforcement responsibility is transferred to the states. Energy resource development programs will be an increasing factor in water and air monitoring programs in the future.

Scenario II and higher activity levels would impact regional area workloads by increased reporting requirements in pesticides, toxics, water, and air quality programs. Scenario III would selectively reduce activity in areas that are not concerned with national systems and supporting legislative requirements.

Figures 4-31, 4-32, 4-33 show projected communications volume for each of the three scenarios for states and EPA facilities in utilizing WCC and NCC facilities.

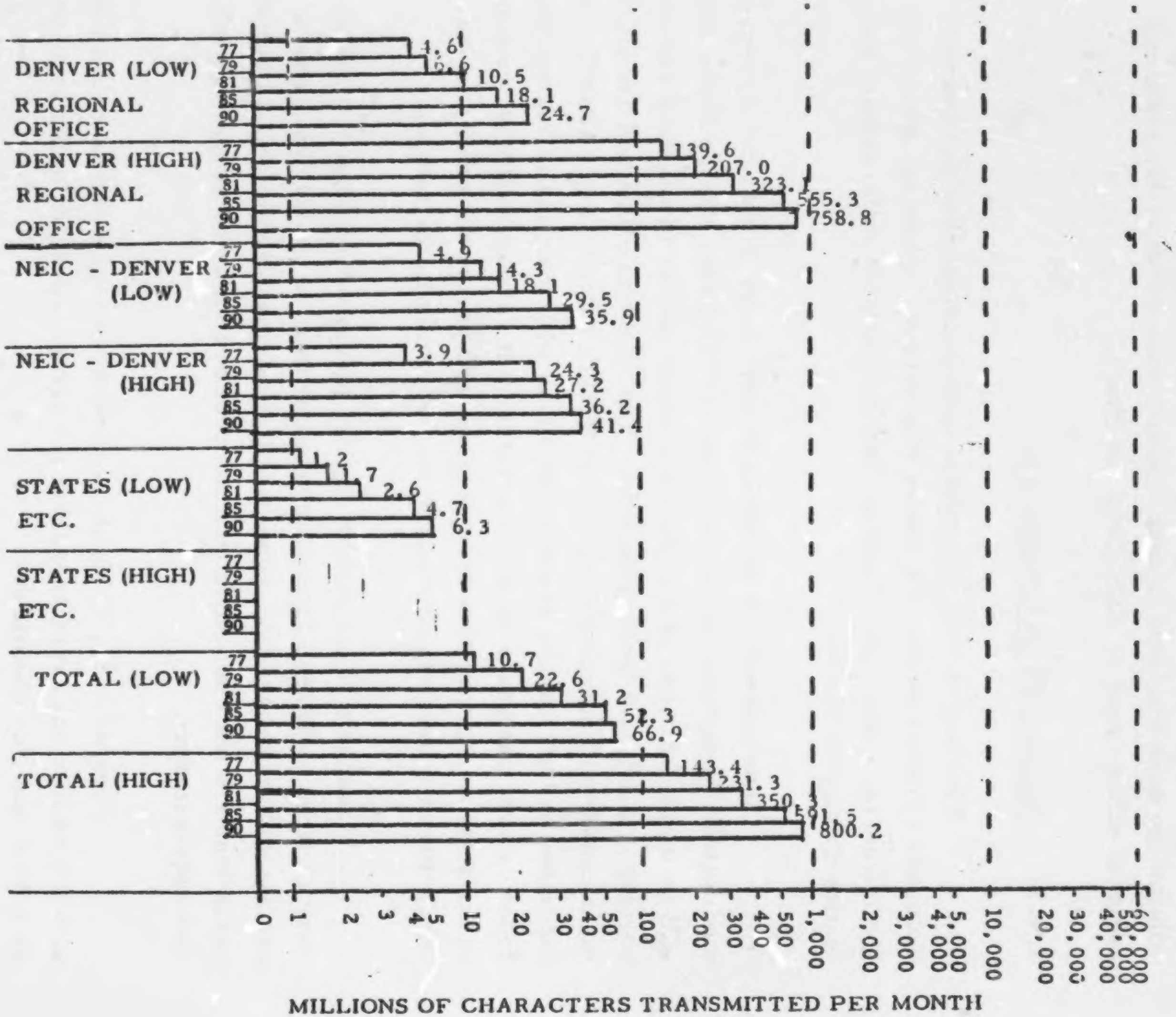


Figure 4-31. Region 8 Geographical Area Communications Workload - Scenario 1

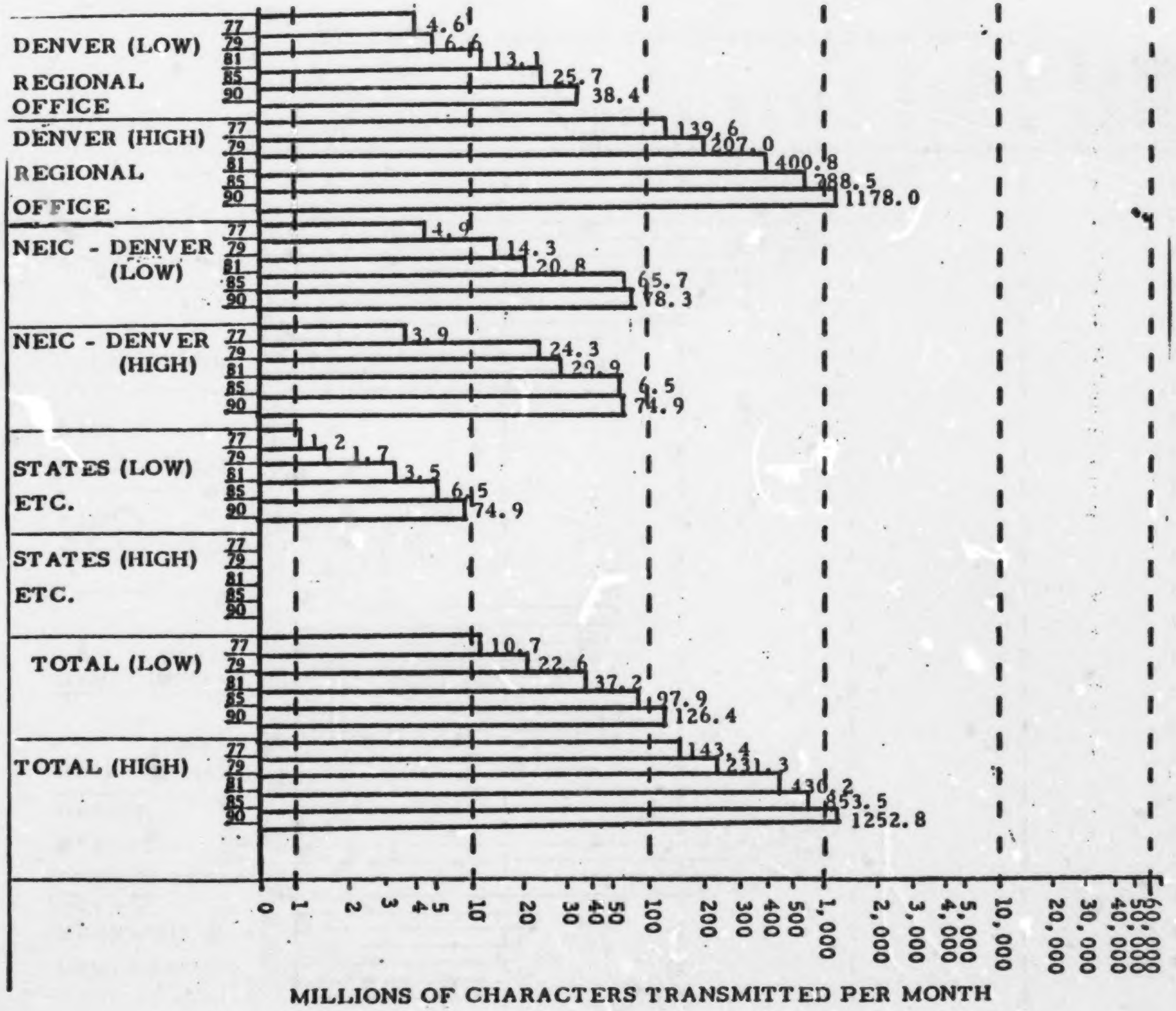


Figure 4-32. Region 8 Geographical Area Communications Workload - Scenario 2

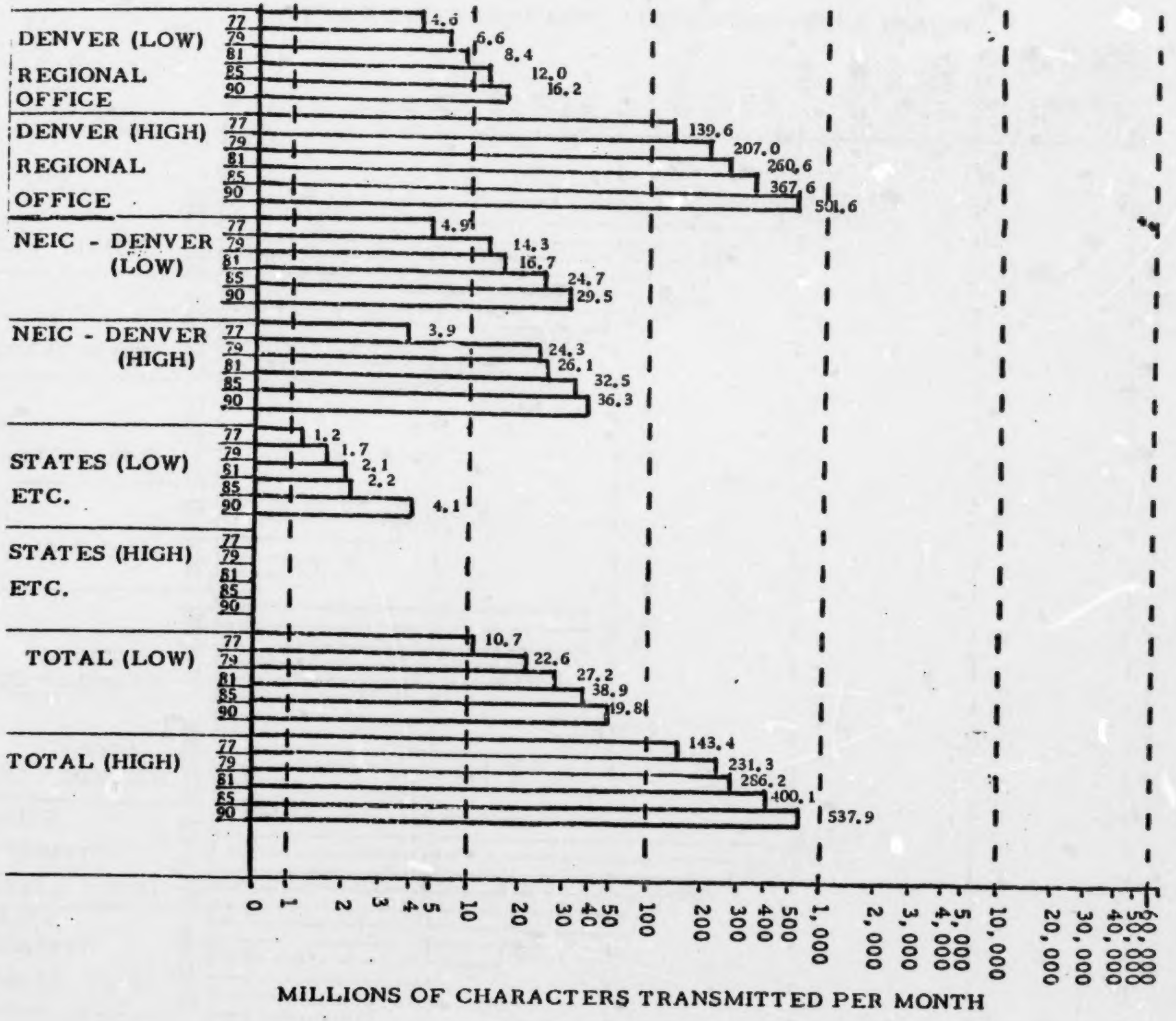


Figure 4-33. Regional 8 Geographical Area Communications Workload - Scenario 3

4.4.12 Region IX Geographic Area

The Region IX geographic area covers the regional office in San Francisco, the states of California, Nevada, Arizona and Hawaii, and the Environmental Monitoring & Support Laboratory (EMSL) in Las Vegas, Nevada.

Scenario I projections of communications workload for the regional geographic area indicate a steady but moderate increase throughout the 1979 to 1990 period. The EMSL at Las Vegas is projected at a slightly faster growth rate than other users in the geographic area due to priorities for programs in energy development impact assessments and evaluation criteria for acquisition of valid environmental data. The regional office workload will increase most in data analysis and modeling activities in air and water programs, with associated intensity in utilization of STORET (WCC) and SAROAD (NCC) data bases.

Scenario II and higher activity levels would increase ADP activities and communications workload in support of water and air quality control programs, and in all research study programs at EMSL-Las Vegas. Scenario III was projected to have little overall impact on communications workload and ADP activities in the regional geographic area.

Figures 4-34, 4-35, 4-36 illustrate projected communications volume for each scenario between WCC/NCC facilities, and user locations in the regional office, the Las Vegas laboratory complex, states, and others in the regional area.

4.4.13 Region X Geographic Area

The Region X geographic area encompasses the regional office in Seattle, the states of Oregon, Washington, Idaho, and Alaska, and the Environmental Research Laboratory (ERL) at Corvallis, Oregon.

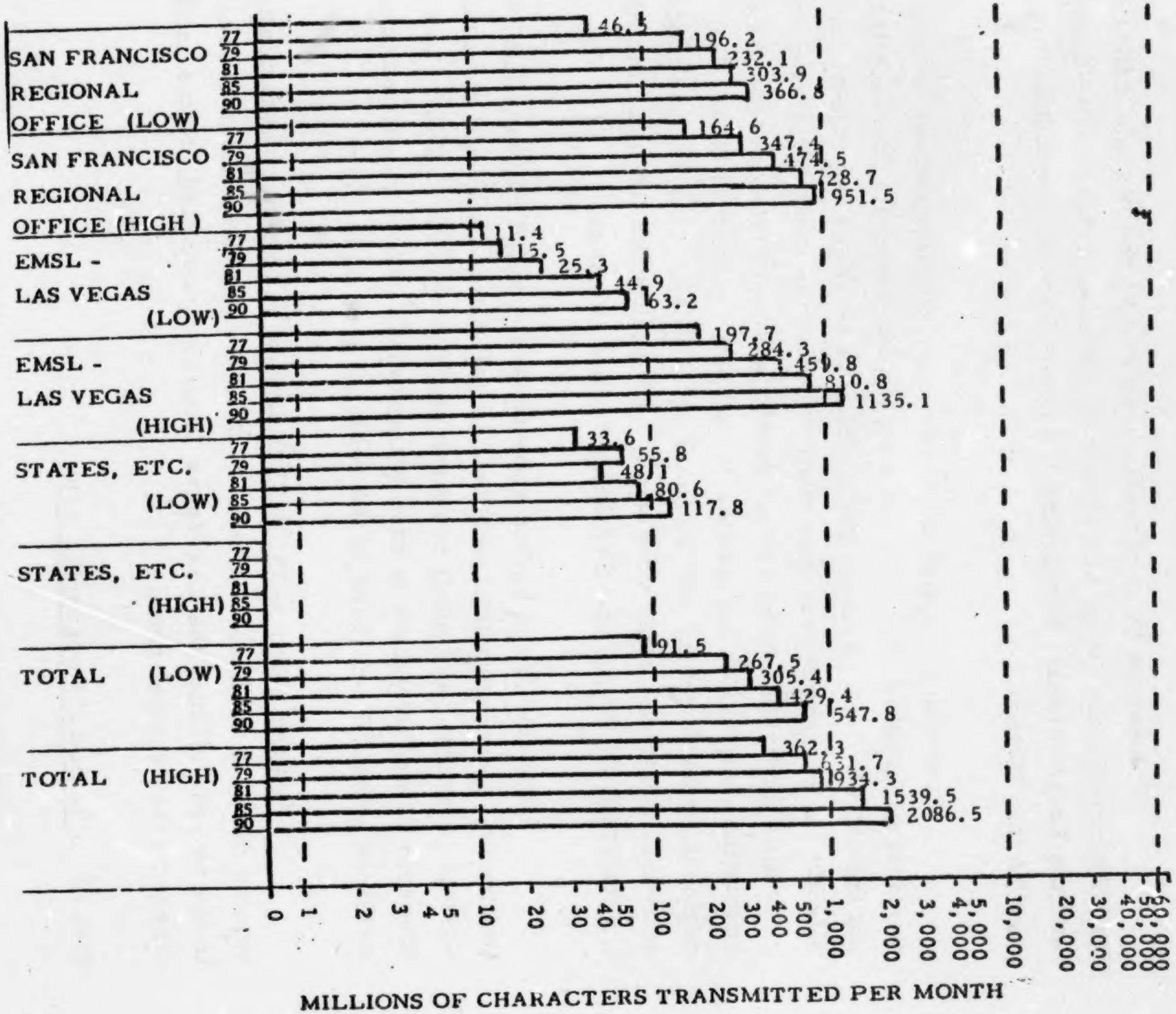


Figure 4-34. Region 9 Geographical Area Communications Workload - Scenario 1

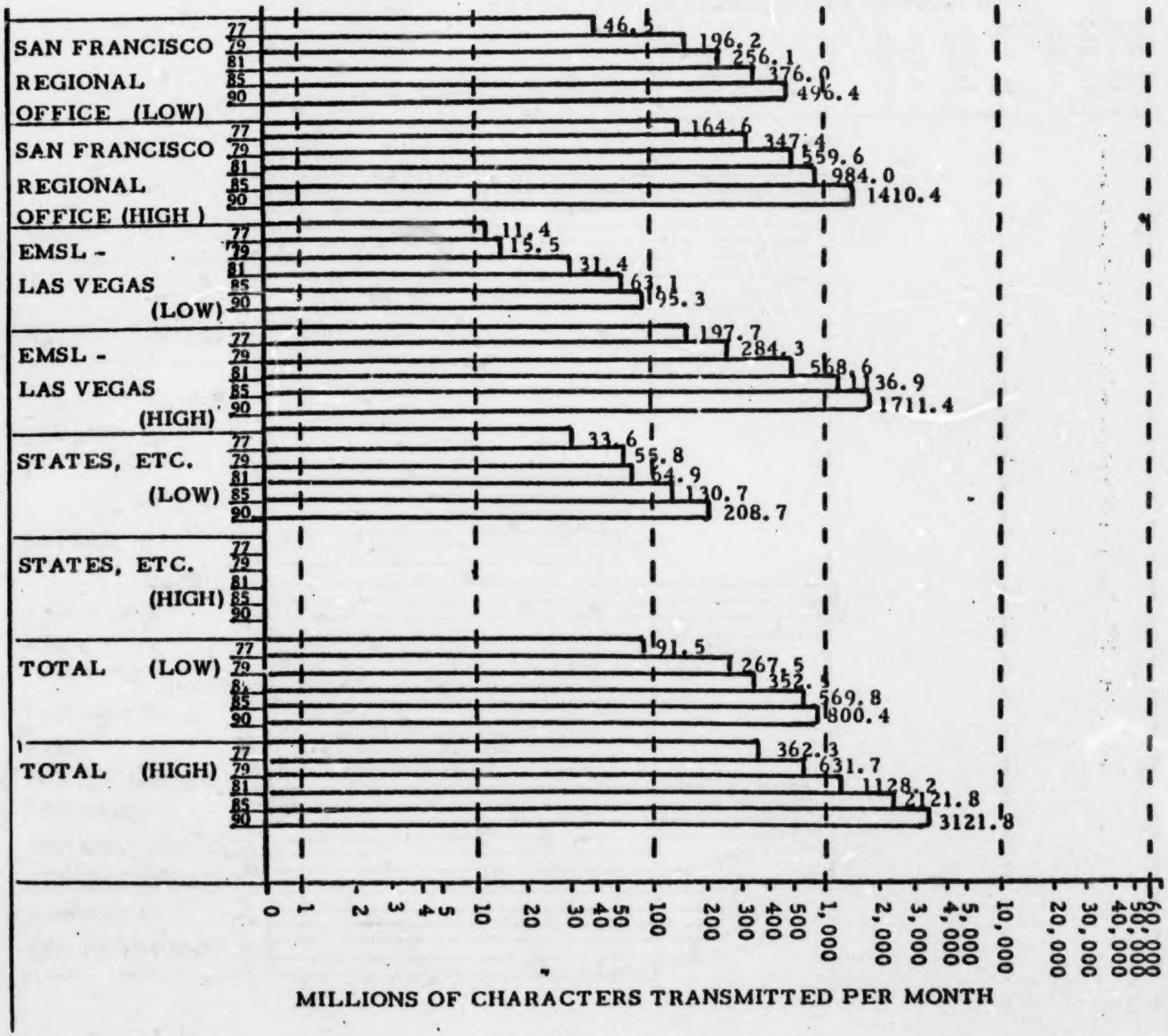


Figure 4-35. Region 9 Geographical Area Communications Workload - Scenario 2

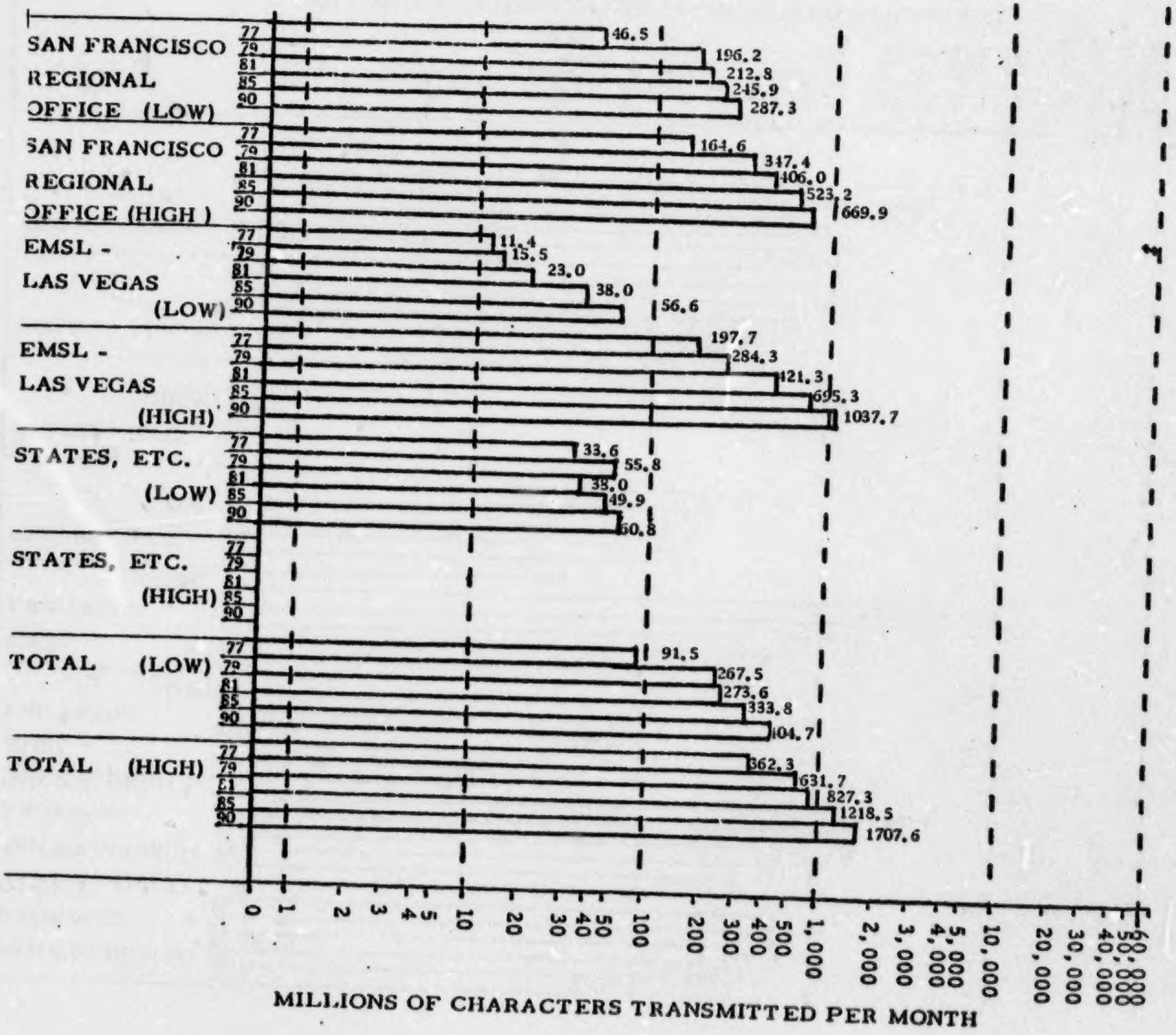


Figure 4-36. Region 9 Geographical Area Communications Workload - Scenario 3

Communications workload under Scenario I shows a moderate but gradual increase between 1977 and 1985. This is caused primarily by increasing usage of the STORET system at WCC for more intensive water quality analysis and reporting under mandates of the Federal Water Pollution Control Act. States in particular are expected to increase their usage of STORET for handling a larger share of data collection in regional water quality monitoring and planning activities. The Corvallis laboratory complex will have a decrease in communications volume prior to 1979 as more functions are transferred to local minicomputers and other systems. After 1979, the laboratory will increase communications workload as mathematical modeling systems in water programs become more complex and greater use of EPA large scale ADP facilities is required.

Beyond 1985, regional office use of central timesharing and associated communications workload will grow less rapidly due to increasing use of a local minicomputer system and fewer implementations of new projects in regional programs.

Scenario II and higher activity levels would increase communications workload in ADP activities supporting standards setting and data analysis in the regional office, and cross-media interfacing of data at the Corvallis laboratory. Scenario III would selectively reduce activity levels in data collection for water programs at the regional office. Less impact on communications workload would be experienced at the Corvallis laboratory.

Figures 4-37, 4-38, 4-39 illustrate projected communications workload for each scenario between WCC/NCC facilities and user locations at the regional office, the Corvallis laboratory, states, and others in the regional area.

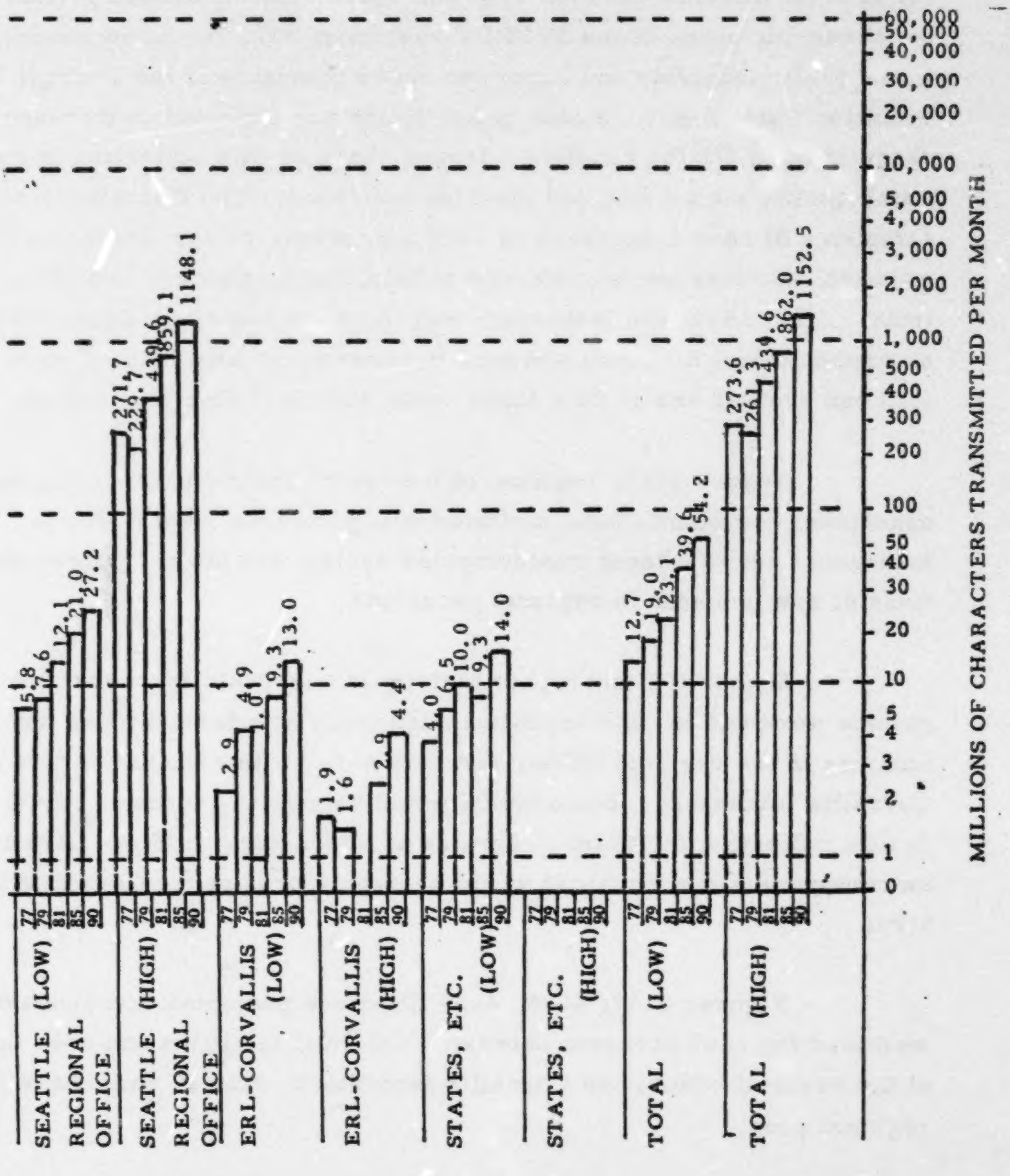


Figure 4-37. Region 10 Geographical Area Communications Workload - Scenario 1

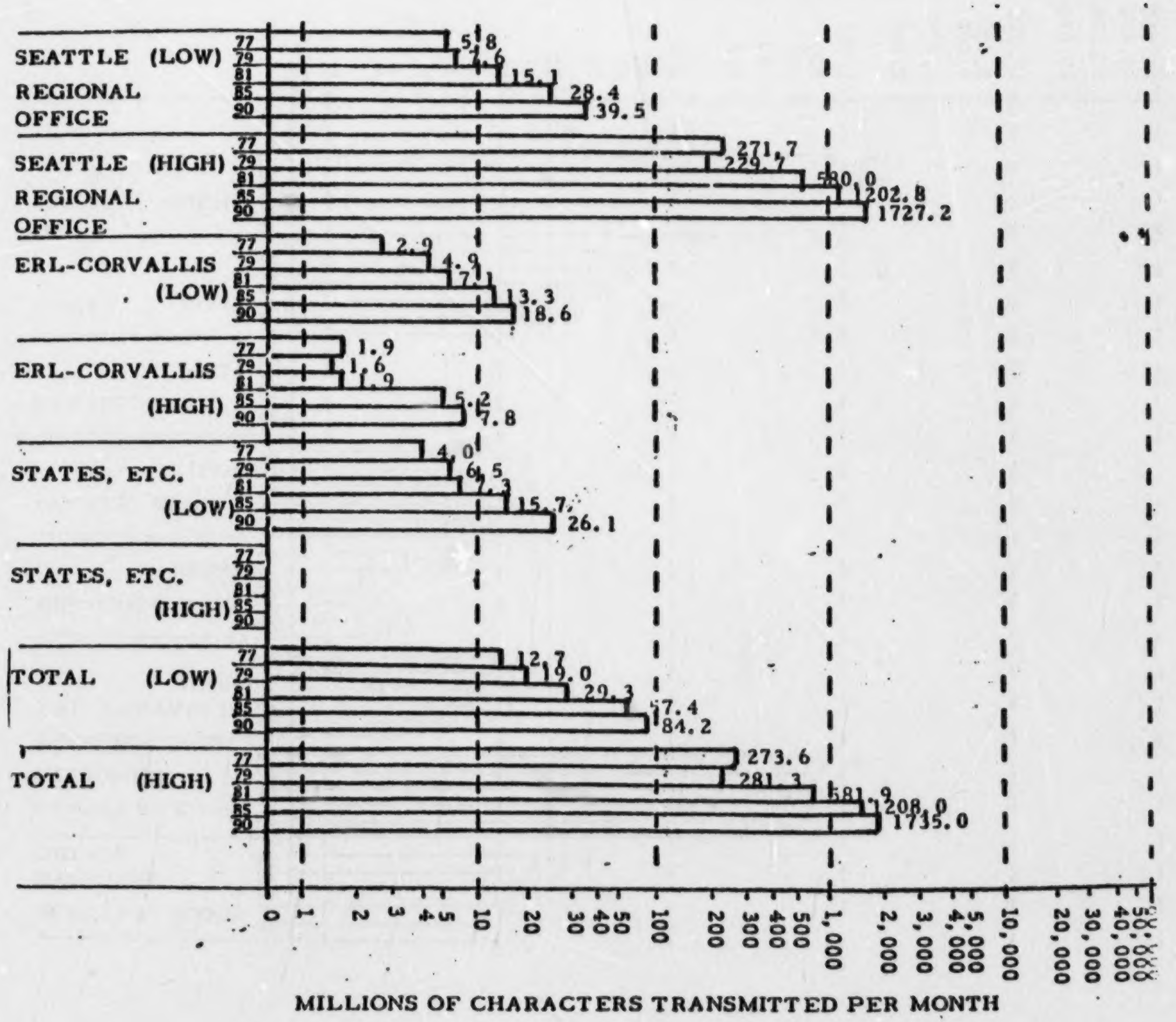


Figure 4-38. Region 10 Geographical Area Communications Workload - Scenario 2

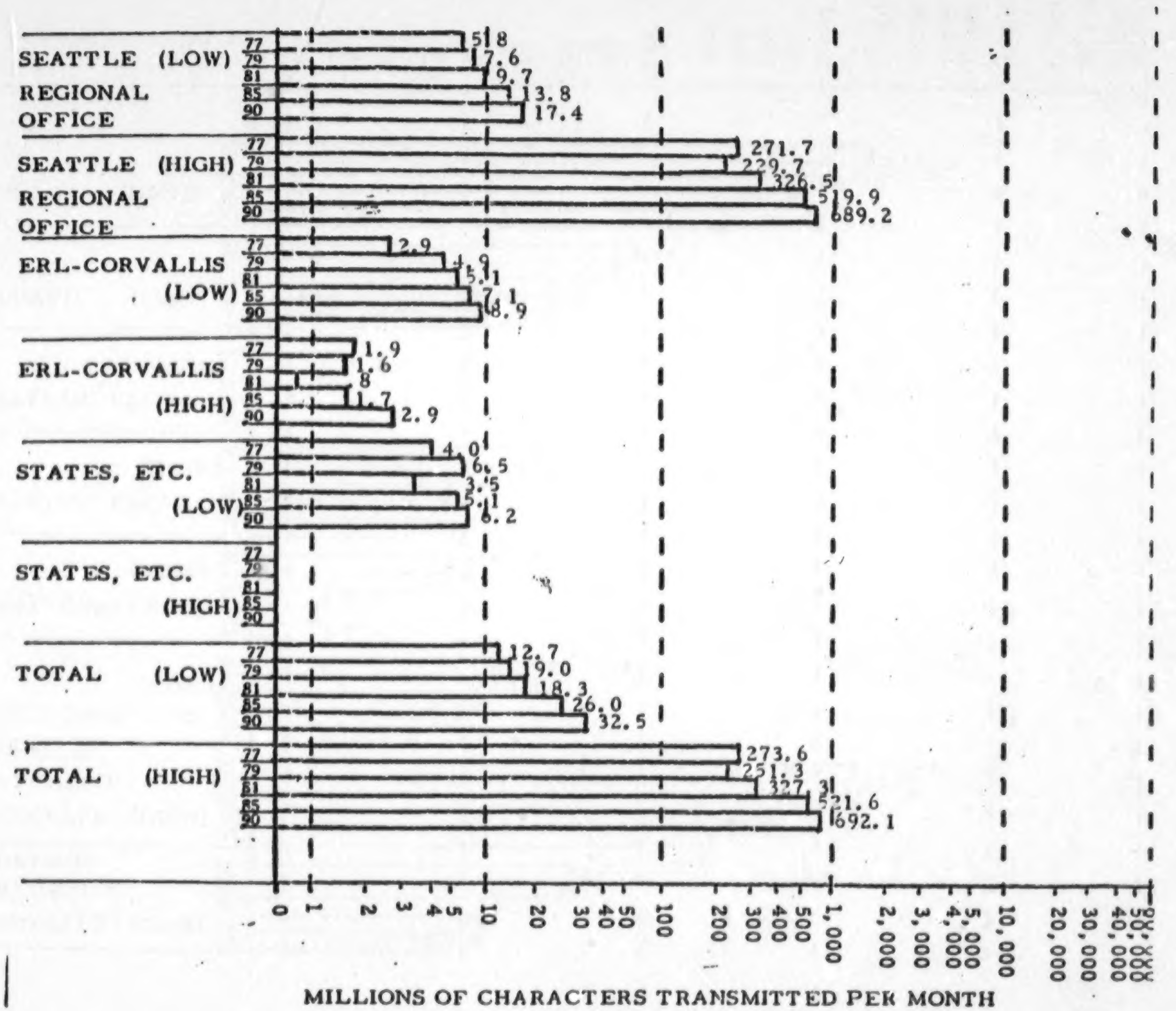


Figure 4-39. Region 10 Geographical Area Communications Workload - Scenario 3

SECTION 5

MAJOR CONCLUSIONS OF THE STUDY

5.1 TRENDS IN TELECOMMUNICATIONS USAGE

Telecommunications workload has been projected over the period through 1990 in line with EPA management expections for overall agency growth rates, program and mission priorities, and uses of ADP in support of program operations. Additional factors involving trends in the use of ADP, technological trends in telecommunications capability, and external influences upon the agency have also been considered.

All factors considered, the use of telecommunications will continue in parallel with growth in ADP utilization, with certain areas experiencing more rapid growth. Factors influencing increasing telecommunications use rates include the following:

- EPA management views of agency futures are toward a slightly more favorable growth pattern than in the past, particularly in higher priority areas such as toxics and other health risk areas. Programs of lower priority which may be influenced by future budget pressures and changes in agency direction will not impact ADP operations and the use of telecommunications as much as other budget elements such as personnel levels and outside contracting
- Priority programs such as toxics will place increased emphasis upon cross-media interfacing and improved data transfer within EPA. The use of multiple data bases by a variety of users in standards development, economic studies, enforcement, and research will tend to increase telecommunications workload proportionately

- Trends already in motion toward decentralization of program responsibility to states and regional offices will tend to place increased emphasis upon national data base facilities as a central repository of large volume data, and large-scale telecommunications networks as a means of providing access

- Future ADP efforts are expected to increasingly stress data analysis and modeling for guidelines development, and economic analysis for risk and cost benefit studies. These projects require large scale computing capability and access to multiple-media data bases most readily available in a telecommunications-oriented ADP system

Another area of significant impact upon telecommunications is the future role of distributed processing or the use of minicomputers in many of the agency offices, regions, and laboratories. The impact of these localized systems upon telecommunications varies with the manner in which they are employed in the overall agency ADP strategy. One approach would support the entry of regional data to a centralized data base and the retention of local data at the user (regional) facility. All interaction of users with local data bases would then be "distributed" at the local level and telecommunications with the central data base would be limited to a small number of requests for data across regional lines.

Another approach more in line with current trends treats the local minicomputer system as a front end to centralized data base systems. Data collection and preprocessing or refinement of data takes place on the minicomputer with lower volumes of "clean" data transmitted to the central system. Interaction with the data base then occurs on the central system, except for occasions when use of more detailed data at the regional level is required.

Regardless of the future role of distributed processing in agency network designs, the need for telecommunications capability will be increasingly important as decentralization and cross-media programs such as toxics grow. The need for access to all data bases for efforts in research, economic analysis, enforcement, and policy determination can only be satisfied for a geographically dispersed organization such as EPA through the use of a responsive network that places all users on an equal footing.

> Note: a discussion of scenario probabilities, ADP trends, and changes in missions and programs by program area is presented in Section 5.1 of the Consolidated Systems Study, Volume II

5.2 TECHNOLOGICAL TRENDS

Telecommunications technology has been rapidly advancing in recent years due to more organizations entering the field. Communication networks have evolved as major elements of a system with services for a broad range of terminal and processor equipment and a broad range of users. Supporting these networks are improved common carrier facilities and more sophisticated network concepts. Satellite communications with advanced ground base techniques are available to support improved data rates and reliability. In the early 80's three of four major vendors will have fully operational shared networks using satellites, generating additional improvements and expansion of the number of ground stations.

Telecommunication user demands have expanded to a point where previous capabilities could not meet them. Dedicated networks have grown to become more complex and less cost effective. Shared networks have enjoyed an exceptional growth rate, thus creating the demand for better and faster transmission of data. Concepts such as packet switching fully support these shared networks.

Management of dedicated networks has grown in complexity and responsibility with changes in tariff rates, expansion in number and types of terminals, rapidly expanding workload, and increased demands for user statistics. This has created the need to separate the network builders from network users, and expanded the staffing requirements to meet changing user demands.

Terminal technology has expanded at a very rapid rate, with minicomputers and larger scale computers now being a part of most networks. Intelligent and graphics terminals are now commonplace, creating the need for more communication lines and higher speeds of transmission.

EPA has grown along with this trend and now has minicomputers at some regions, intelligent and graphics terminals in the laboratories, and a wide variety of standard terminals in all locations. The vast majority of EPA ADP workload is performed within the two centralized computer facilities in Washington, D.C. (WCC) and Research Triangle Park (NCC). Field minicomputers interface with this hardware by preprocessing input data and generating output reports from data maintained in the central facilities. Most organizations within EPA have some type of terminal connected to one or both of the facilities. Graphics display terminals are rapidly being added to the EPA inventory. Other field locations are performing feasibility studies to obtain local minicomputers.

These expanding demands will create the need for special considerations to be given to the telecommunications networks proposed as a part of future systems. Accuracy, timeliness and reliability will be key factors in any final decision.

One of the special features directly applicable to EPA is the capability to respond to remote data entry requirements. In addition to the more standard use of keyboard terminals for data entry, EPA uses remote sensors and mobile field stations. Even flying stations are used to test air quality and particulate movement. These requirements may be met by subnetworks, or networks completely outside of the basic network.